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# CoEVOLUTION Quarterly

Ocean Arks Page 46 & The Whole Sea Catalog Page 74

No. 23 Fall 1979 $3.50

*Whether admired from a distance of 22,000 miles or 20 feet ours is an ocean planet, dazzling blue, dominated in every respect by its water.*

*A couple years ago we had a Watershed Issue of* CoEvolution, *deservedly popular, which put forward a politics of watershed-consciousness, utterly local – where and how the life-blood flows in your locale. Now drift down that flow to the sea. Though still personal, Ocean-consciousness is inescapably planetary. Just so the salty first 103 pages of this Oceans Issue. (The last 40 pages are* CQ *business as usual.)*

*The guest-editors of the section are experienced on three valuable counts – they edit, they know nautical material as few alive, and they mess with boats. Working out of Penobscot Bay in Maine, George Putz and Peter Spectre have co-edited 6½ volumes of* The Mariner's Catalog, *a wondrous access-and-assessment publication. (A seventh volume is due late this fall.) Over the years they have accumulated material and ideas too oceanic for their boat-oriented catalogs but just right for* CoEvolution. *Hence a happy collaboration this summer in Sausalito – different coast, different ocean, same water, same truth.*

*I keep coming back to a remark by David Crosby, the public musician and private mariner, that turned up in* Rolling Stone *a few years ago. For me it sums up what the sea does for the individual and what it may yet do for humankind. Crosby said:*

"You can't bullshit the ocean. It's not listening, you know what I mean?"

*–Stewart Brand*
*Editor,* The CoEvolution Quarterly

# CoEVOLUTION Quarterly

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*The Covers:*

*Two decades ago, Robert Indiana aided the so-called crisis in modern painting by bridging the gap between those lonely spires of personal experience called abstract expressionism and the larger buttes of commonly shared experience. The bridge became known as Pop Art, and his most notable work in the genre was the famous* LO VE *motif, which became one of the icons of the 1960s. Last year, Robert moved his studio to Vinalhaven Island in Maine. Our front cover, "Mother Sea, Father Earth," is his first work from the new digs, and it heralds a new period, since "there are all those creatures out there waiting . . ." 'Tis a privilege, Robert.*

*The photograph on the inside front cover was taken by George Putz on the shore of Vinalhaven Island, Maine.*

*The color photograph on the back cover is by Don Ryan of a multi-medium sculpture (wax, wire, paint, plaster, etc.) by Isabella Kirkland, who worked beyond reason for a couple of days to finish the project to meet our demanding schedule. The photograph of the tanker is from a poster advertising Stewart Brand's latest fetish, running lights; it was ripped from his office wall as he slept. Cover design by Kathleen O'Neill*

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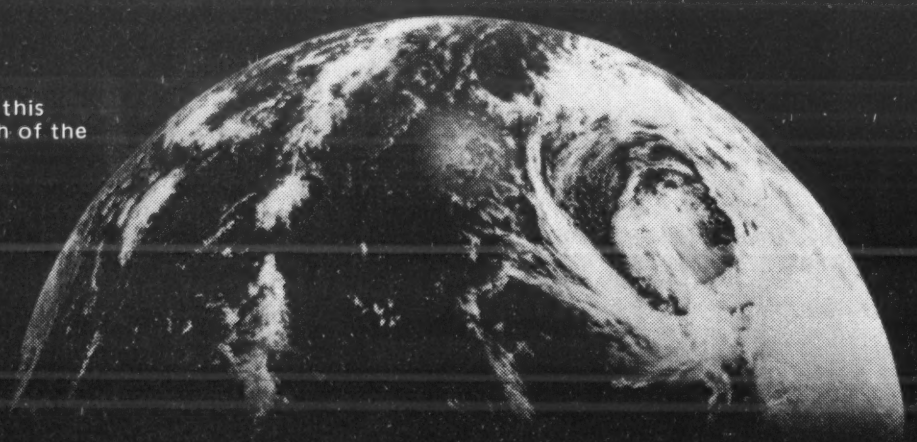

The water planet. In this Apollo 13 photograph of the Pacific Ocean, almost no land is visible (the bits of Siberia and Alaska in view are covered with crystalline water). Astronauts have referred to the Pacific as "the great blue eyeball."

*NASA*

# The Ocean

## Full Wilderness, Empty Wilderness

*by George Putz*

*"AT AROUND THIS TIME, Horowitz even felt encouraged enough to begin speculating about what effect a barren Mars – if the planet proved to be barren – would have on their view of the chemical origins of life and, in particular, on the existence of life elsewhere in the universe. 'If Mars is barren, it will force us to take another look at the earth,' he said. 'It will make our ocean seem more important. On a planet like Mars, you might have all the chemicals you need for life, but they won't meet. Our ocean is a nursery; it provides the solvent – water – in which chemicals diffuse and collide with each other. It's a nursery in that it has a constant temperature over a long period; it provides continuity. Nothing on earth is as old as the ocean – not the mountains, not even the continents. We have the only ocean in the whole solar system. If, in the end, it turns out that Mars is lifeless, the idea of the ocean as the nursery of life will take on a new importance. Planets without oceans become less likely habitats for life. But in other solar systems there must be hundreds of thousands of other planets with oceans.'"* *

But it is very difficult to pay attention to our oceans. Though we are an advanced sort of fish with blood salinity exactly like it was when we emerged as fish from the oceans, and though all things terrestrial, including the terra, have come from the sea and make every effort in response to gravity to return to it, we tend as a people to abuse the ocean if we are not allowed to ignore it.

The reasons for this are easy enough to see. When we look from the shore, it is easy to think that the sea is desolation, that there is nothing there. If the sea is desolate – dangerous, too large to comprehend – then it is easy for people to fall into something like superstition about it, to feel it a source of evil, or to think it infinitely able to receive our evils, our effluents, and whatever damaging activities we care to apply.

Too, if we see the ocean as marvelous – a wonderful wilderness, an attractive place to go and wonder – then it is easy to subject it to that *tabula rasa* cast of mind that has projected so much narcissistic ill on so much wilderness in recent years. Too many people labor under the peculiar notion that the wilderness is there so we can get away from civilization and join nature. Clearly, desolate wildernesses, like the ocean, have their detractors and their lovers, both misunderstanding and damaging them about equally.

Yet views of the ocean as full wilderness or empty wilderness are views from the shore – the ocean seen by landsmen who think that if you can't control something, then mentally manipulate it so that its vastness will excuse exploitation of whatever ilk. Mariners who have lived at sea know better. The differences between the way mariners and landsmen see the world explains much about the conflicts between our behavior and the health of our environment.

It comes down to what a person has to do to face his day. Farmers in every age have tilled bottomland, or land that through their own efforts was made to have the same characteristics as bottomland. They lived with either regular, annual floods or with massive efforts at water control. They were intensely involved with the annual weather cycles and the larger cycles of the climate. But successful agriculture created sedentary lifestyles for some and allowed wealth to be accumulated in good years in the form of grain to be credited

*From "A Reporter at Large, The Search for Life on Mars, a Residue of Doubt," by Henry S.F. Cooper, Jr., *The New Yorker* (February 12, 1979).

against losses in poor years. Wealth allowed relatively rigid classes to form and led to the establishment of cities, both for trade and to harness the failed human effluent of the farms. It led to standing armies and hierarchical religious orders to sanction and control the social order. Security, though tenuous for all, was withheld from those innovators whose activities were construed to be sinful or from those deviators who were suspected of breaking the all-important rules that kept the water coming and the crops growing on schedule, year after year.

Maritime people, on the other hand, find such values anathema. They are subject to centralized power beyond that found aboard ship, but such power pales and is easily forgotten before the forces of tide and wind. Change, risk, innovation, and deviation are inherent to the activities of the mariner, and tolerance of others's oddness is essential both to the operation of the ship's business and to the success of the ship's company's international contact and trade.

Trading and navigation creates cosmopolitanism. For a mariner to go somewhere else for goods in exchange for his own puts him in contact with other types of people. If he is unable to get along with these people, he will be unable to trade. Tolerance was a must for mariners long before it was even considered for landsmen. Even the mariner's idea of truth is based on what is seen inductively to work, yet the innovator at sea, if his innovation fails, is more likely to be seen as foolish rather than immoral, as the landsman is most likely to see him.

Maritime people are subject to storms that appear for no known reason and destroy all they have, or are confused by fish that are one year abundant and the next year inexplicably gone. Because of this, they don't try to predict or control their environment, but rather move through it with survival skills based on a combination of handed-down folk savvy and improvisation. But on land, if you plant the corn as you did last year and keep the irrigation ditch in repair, the corn will probably grow as high as it did last year and be ready for harvest at the same time. And if it doesn't, you may look for reasons and scapegoats and forms of insurance *before* you figure out how to muddle through the immediate problem. The predictability of the entire process – at least relatively predictable compared to similar circumstances at sea – may delude you into thinking that you can be successful at anything if you follow the old rules carefully and collect enough power.

We have, then, a land society that has a propensity to centralize authority, an opportunistic and manipulative attitude toward territory and land use, and an epistomology based on a deductive, principled moral approach, sometimes called magic, other times called the scientific method. As this approach wears down the earth, it might seem that the time has come for landsmen to learn from mariners. But the flow is in the opposite direction. The land is invading the sea.

Since World War II, the oceans have been dramatically changed by the introduction of capital and High Tech – modern materials, large vessels and gear systems, electronic navigation and control systems, and management systems set up exactly like non-marine enterprises. Though big-money landsmen have not yet learned to farm the ocean, they have developed highly efficient hunting and gathering hardware, and have discovered the end of the natural fish stocks. This has led to management meetings where bureaucrats from Iowa and fishermen from Maine glare at one another across tables, the latter's traditional rights and lifeways doomed, the former acknowledging the loss with impunity.

It isn't just the fish, mollusks, and crustaceans that have been overharvested by the products of land-based technology. Marine plants and animals are being harvested not only for food, but also for a growing list of substances with industrial, pharmaceutical, and domestic uses that are at least interesting, often extraordinary. And rocks – the mining of manganese nodules at the bottom of the seas is only a beginning to be followed by the systematic extraction of many minerals as our growing understanding of plate tectonics instructs us where to look for them. The seawater itself is a great soup of minerals and other materials known and unknown – all to be exploited and managed with the instincts common to urban boardrooms, not the old-fashioned countinghouses run by the retired fathers and younger brothers of shipmasters.

And of course there's oil. In some parts of the Gulf of Mexico, sailing in a small boat is like walking in a dense forest – winding past one drilling platform after another, each one so huge it dwarfs human figures and can ignore the question. "What if something goes wrong?"

Land instincts have affected the Navy, too. Undefined and at loose ends during the Viet Nam conflict, the Navy now enjoys the anonymity of a silent, technological orchestra, tuned and waiting for a few missing players before playing the finale. There may be some senior officers and perhaps some old chief petty officers around who can "pick up a bowline," but the esprit de corps now lies wholly with the submarine forces, for, except

for the sword-rattling of a missile frigate or two, defensive-attack and first-strike undersea boats are the whole ballgame. That NASA on leaving the moon seemed for awhile to opt noisily for undersea research, and then silently abandoned it, was not a fluke. Terminals, knobs, and dials are the same at sea as on land or in space. Bettleheim's Joey* is now grown up and has discretionary funds.

If we care for the planet and want to protect it from Joey and notice where we are and who we are, perhaps the best place to start is by the sea. On the beach we can bask, walk, stare, collect, splash, run, show off, make constructions we know are doomed within a tide's time, and we can renew. We can dream, and those who've acquired the wherewithal to fulfill their dreams can build their structures out over the fragile outposts and hardened shores alike, paying their cover and minimum at God's peepshow. You want to see it? You have to pay for it. You want to touch it? Here, buy a boat.

Or, rather, read about boats – at first, anyway. Like the pacifists who suddenly discover the brilliant ingenuity and beauty of Browning's gun-patent diagrams, something clicks within you and you notice that all those boats that have looked alike for so long now have become individual, and intriguing, and clever, and divided into ones you like and ones you don't like. Richard Henry Dana, Captain Bligh, Joshua Slocum, and a host of new names etch themselves into your own private pantheon, and marine museums, with their models, become weekend fare. Soon, you gottahaveaboat! Municipal support for the re-rigging of the great derelict squarerigger *Old Girl* becomes terribly important, and, even though you never cared one jot about the performance of your automobile, you'll spend $5,000 on the difference between seven and eight knots.

These part-time mariners want somehow to be part of the sea – a great, glorious, soaking, absorbing, fecund thing. And boats, which are great sculptures, not to mention platforms on which self-determination and some considerable competences can be developed and practiced, are the vehicle. They are places where one can find, confront directly, and overcome fear. On boats, the disheveled, disorderly, and dirty are known immediately, as is the true character of one's company. One can tell, for instance, whether shyness comes from equanimity, stupidity, or rage. Once discovered, the qualities of being a good shipmate become the model for all one's subsequent associations. One can do no better.

One grows up eventually. There may be no circumnavigation in your life – no 90-foot schooner on which you are boss – no great discoveries or conquests made. Perhaps your satisfaction will be just a pretty craft you care about, can afford, share. Or maybe not that either. Perhaps your maturity will come with the habit of walking the shorelines, growing into some understanding of our origins in the sea, cherishing those origins and trying to remember. For we are still fish; the experiment continues. Though we can no longer breathe the ocean, we can certainly never live without it. We are neither wholly fish nor completely the land-based computers we take ourselves to be.

Larry Gonick, *The Cartoon History of the Universe.*

Like merpeople, we are necessarily torn between abilities. We are an extremely odd experiment. Considering that it has been only a thousand generations since any stem on our evolutionary tree became urbanized, and far fewer for most northern-European-derived folk, we must be at least a little sanguine when we notice that a thousand generations of fruit flies (or whatever) are a laboratory commonplace, yet from studying those thousand generations we can only barely see whether some recessive possibility, some trait in fruit flies, can make it or not. We must reasonably expect cultural life to be a failure, as almost all of nature's radical experiments turn out to be, especially when they involve gigantic expectations amidst limited resources.

There is an American mental habit of seeing gigantism – bigness – as an advanced natural

*Psychologist Bruno Bettleheim's earliest published work followed the fortunes of an autistic boy named Joey. From an early age, Joey fixated on mechanical and electronic contrivances and could not do any physical task without the particular gadget he had designated for that function. He is known in psychological literature as "Joey the Mechanical Boy."

ILLUSTRATION BY JAHRMARGL AND DAVID WILLS

*A Family of Southern Selkies*

state of things. We tend to think that successful organization of any kind begins small and advances to large. In fact, gigantism occurs quite early in the speciation process, and almost always it is shortlived because of the enormous quantities of nutrition required to support it and the inevitable ponderousness of the harvesting mechanisms. The notorious populations of truly large dinosaurs flourished for as long as they did only because the supercontinent they called home was mostly subtropical swamp, the most biotically productive terrestrial ecosystem there is. The Pleistocene experiments in bigness, mostly a temperate-veld phenomena, were much shorter-lived, and the utter end of them in Africa and India shall be seen in our lifetime. People, Homo sapiens sapiens, are giant rapacious Pleistocene primates.

We are an experiment, and the evidence is pretty good that we are a failed experiment, being denied even a significant portion of the million or so years most potentially successful evolutionary developments are allowed to, or not to, get their acts together.

If there is hope for this species, it lies in the brain's ability to consider properly its own ancient origins – fish. Not a few Buddhist koans ask us to be fish again, and they are correct. Noting how singleminded, unoriginal, and totally schooled fish are should give any thinking, free-willed iconoclast considerable pause, for the essential changes wrought by 350,000,000 years are remarkably few and marginally important.

So the cover icons of this issue of *CQ* are merpeople. They are frustrating icons. Expertise on them is mostly frivolous drivel gleaned from professorial gazings at ancient art and folklore hobbiest's speculations about sailors fucking dugongs. They appear in history from the Assyrians onward; they are most known as tritons among the Greeks and for their obstreperous qualities with the Romans. Bestiaries are full of merpeople's kin, and the Celts mix them with the Selkies, the Seal Folk who are the reincarnations of lost sailors and who bless or curse the enterprises of men who happen upon them. No doubt many sailors did ball dugongs or manitees, and their experiences entered legend.

Merfolk don't seem to think. They just feel well or poorly, bless or curse the activities of men, and sometimes scheme willfully, rather than intellectually, over matters of their desire. These characteristics aren't so very unfamiliar. It is their fish half that deserves special attention. It allows them, first, to live in three dimensions, and get all around, over, and under everything – surely an advantage in looking for the truth of things. It lets them live in the density of the ocean, with a vast orchestration of sounds from things and events hundreds of miles around, a broad-band, no-squelch spectrum where gossip reigns supreme.

Mermen don't work much. In Greek illustration, they blow conch shells a good deal and seem to like escorting notorious marine enterprises. Except for the audio, their environmental consequences don't amount to much. Mermaids, on the other hand, seem to be hard-working survivors, relatively gorgeous and with a cast of mind and character much like truckstop counter girls before food stamps and ADC diluted the breed – loyal to a fault and wrathful beyond comprehension.

They are not bad as humans go. They have remained with their address of origin. They live forthrightly within their ignorance. There aren't very many of them. Their contacts with others are reticent, fortuitous (they don't run around bugging other merpeople), and in celebration of what is possible and feels good. They don't seem shocked at the consequences of their own or anyone else's acts – in other words, the relative disposition of their head and dorsal pore is not reflexive.

This is not the nothingism it seems. Were merpeople a real species, their colors would wave longer than ours, and they would have the good sense to understand the ocean. Where we have placed our ignorance, our pollution, and our canisters of death, they would place their lives, loves, and society with others. They are naked in the ocean. They do not hide their mortality under delusions of art or artifice, save for combs and mirrors (self-respect and reflection), and any ambivalences they may possess are in a context where voluntary simplification need not be construed as either generally contemptible or specifically a waste. If they had a split brain, their human half would express itself appropriately, in balance with the self-trust needed to navigate by intuition.

Meanwhile, we need not fear their little tricks, because they don't exist, making them – along with unicorns and Edwardian gargoyles – among the few species safe from us. We should do as well. ■

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*For years in every issue of the* National Fisherman *– once a month to be exact – there has appeared on the editorial page a letter datelined Saturday Cove, Maine, written by one Cap'n Perc Sane. Each letter tells about the goings on in Saturday Cove, a tiny fishing village on Penobscot Bay, and chronicles the exploits of such characters as Shorty Gage, Beulah Banning, and the Old Man. Cap'n Perc Sane in real life is Mike Brown, and though his letters , as Mark Twain would say, "stretch the truth," the truth is what he writes about. This version of the truth was originally published in the July, 1979* National Fisherman, *and is reprinted here with permission.* –*Eds.*

---

**Saturday Cove,**
**Maine**

Dear Editors,

The gummint van showed up again the other day. The Cove here is on the red list as an underutilized port. Been that way ever since Shorty Gage wrote in f'a free paper on how t'raise salt water frogs.

Well, damn, that did it. Every couple of months, the gummint blows inta town n'lays out a few schemes t'save us from ourselves. Most all of us don't haul f'the day 'cause we usually get a free meal outa the lectures.

Head fed said, after roundin' us all up, that their U-2 spy plane flyovers of the Cove had spotted some strange algae that clearly want in their underutilized species catalog. It showed up yellow on the films n'underutilized was always red.

A posse was formed soon as the feds got their coveralls on. They are light blue this year, with orange piping down the legs. We was already t'start out with Pud Hall in the lead when Bubba Beal, the clam cop, screeched t'a stop in front of the store in his green '47 pickup n'wanted t'know what the hell was going on.

The feds put poor Bubba inta what they called protective custody, saying they didn't want any local law interference. Bubba didn't mind. He went inta the gummint van n' watched cartoons f'a couple hours while we was gone.

With Bubba outa the way, Pud led us down through the Cove shore, inta every filthy fish house n'even up t'the old bottle dump below the summer cottages. The feds didn't pick up one bleep on their algae counters. Headin' back t'the van f'a lunch of Campbell's Manhattan clam chowder and Milky Ways, we passed Amos Drinkwater's old sump hole n'this first class underutilized sergeant started yellin' like hell.

Amos' sump hole was covered with green slime 'cause his damn chicken house sits right on the edge of the hole. Anyways, the feds went wild scooping up the slime with butterfly nets n'puttin' it in jars with long numbers on the side. They cleaned the hole right out. First time that's happened in 40 years.

Back at the van, they rushed the slime right inta the lab, which was on the second story with the movie theater. While waitin' f'clam chowder t'heat in the microwave oven, the feds passed out underutilized species packages..

There was one on clam flat patties. Another on seaweed salad with skulpin tail dressin'. Beulah Banning just went wild over the instructions on how t'make baitbag biscuits. Shorty Gage n'Slats Farnum got right inta the bock beer from gull droppin's paper.

While the feds was settin' the lunch table with paper clam chowder bowls, we watched a slide show on producing energy from no'theast gales. This windmill was set up on a wharf n'they waited two years f'this gale. When it came, it took the windmill, wharf n'all right off its pins.

The head fed explained that while the windmill was in operation, which was 'bout two revolutions, it produced fantastic power. However, there were a few refinements t'be made. Like the downtime.

Most of us passed up the clam chowder but we ate five boxes of Milky Ways. Just as we finished, the lab report came in on Amos's slime. The feds were beside themselves. Said it was the closest thing to chicken soup since the barnyard hen.

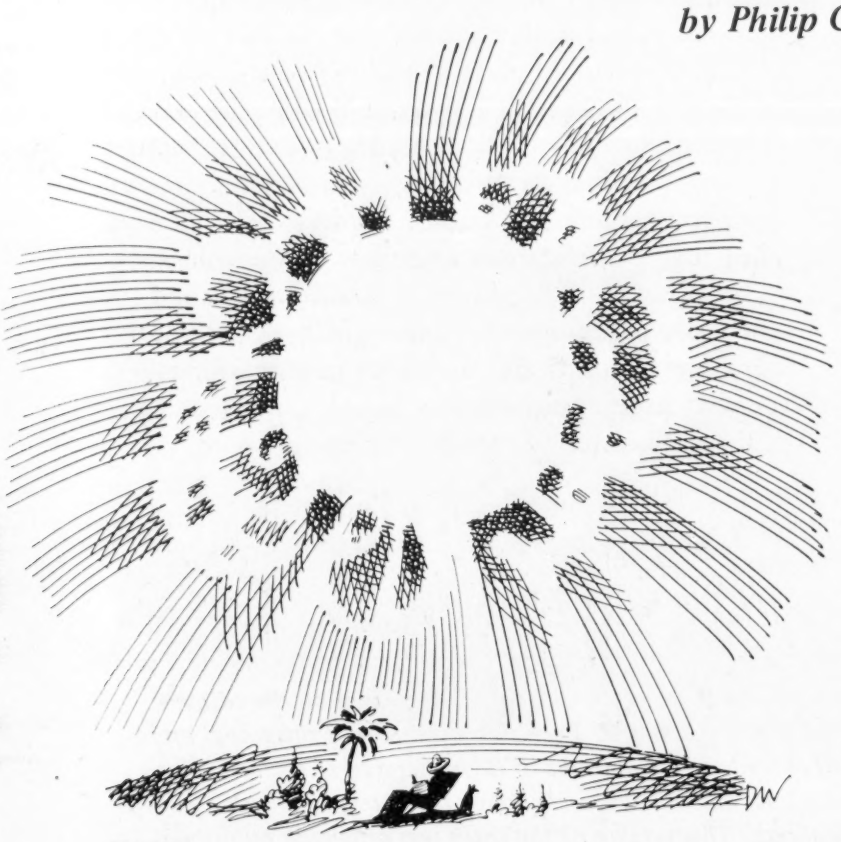
We deplaned the van with the underutilized press kits, n' the gummint boys peeled out f'Washington with 500 gals. of protein for the next space shot.

Shorty n'Slats had their gull droppin' still half set up 'fore the feds rounded Hall's Corner.

Best regards,
Mike Brown

# MODELING THE GLOBAL CARBON CYCLE

*by Philip Conkling*

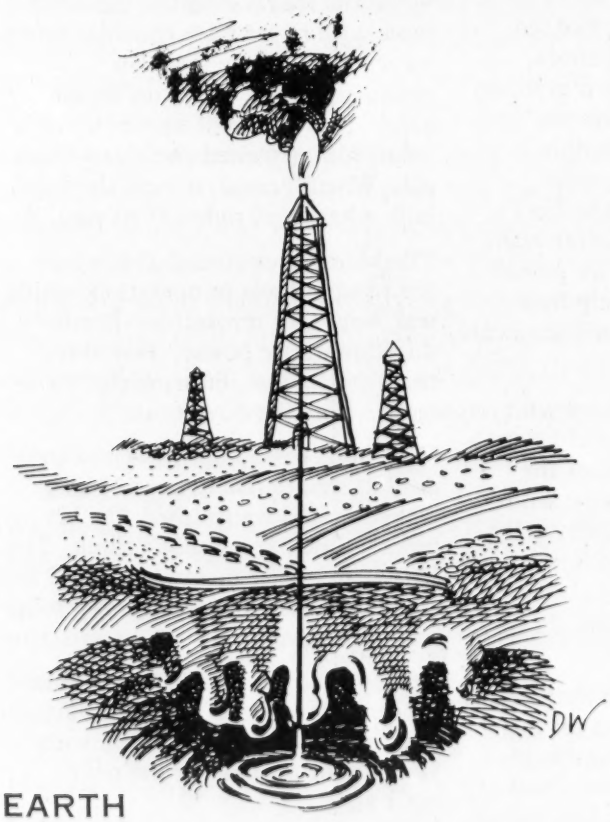


## FIRE

The solar energy beamed to the earth warms the land and is ultimately radiated back into space, except for the tiny fraction that is transformed through photosynthesis into organic molecules, and the portion that is absorbed by the atmosphere.

## WATER

The sea is a salty soup; a sink into which all things empty; a solution through whose mysterious chemistry all materials are ultimately dissolved: tin cans, boats, granite, consciousness, and carbon dioxide.



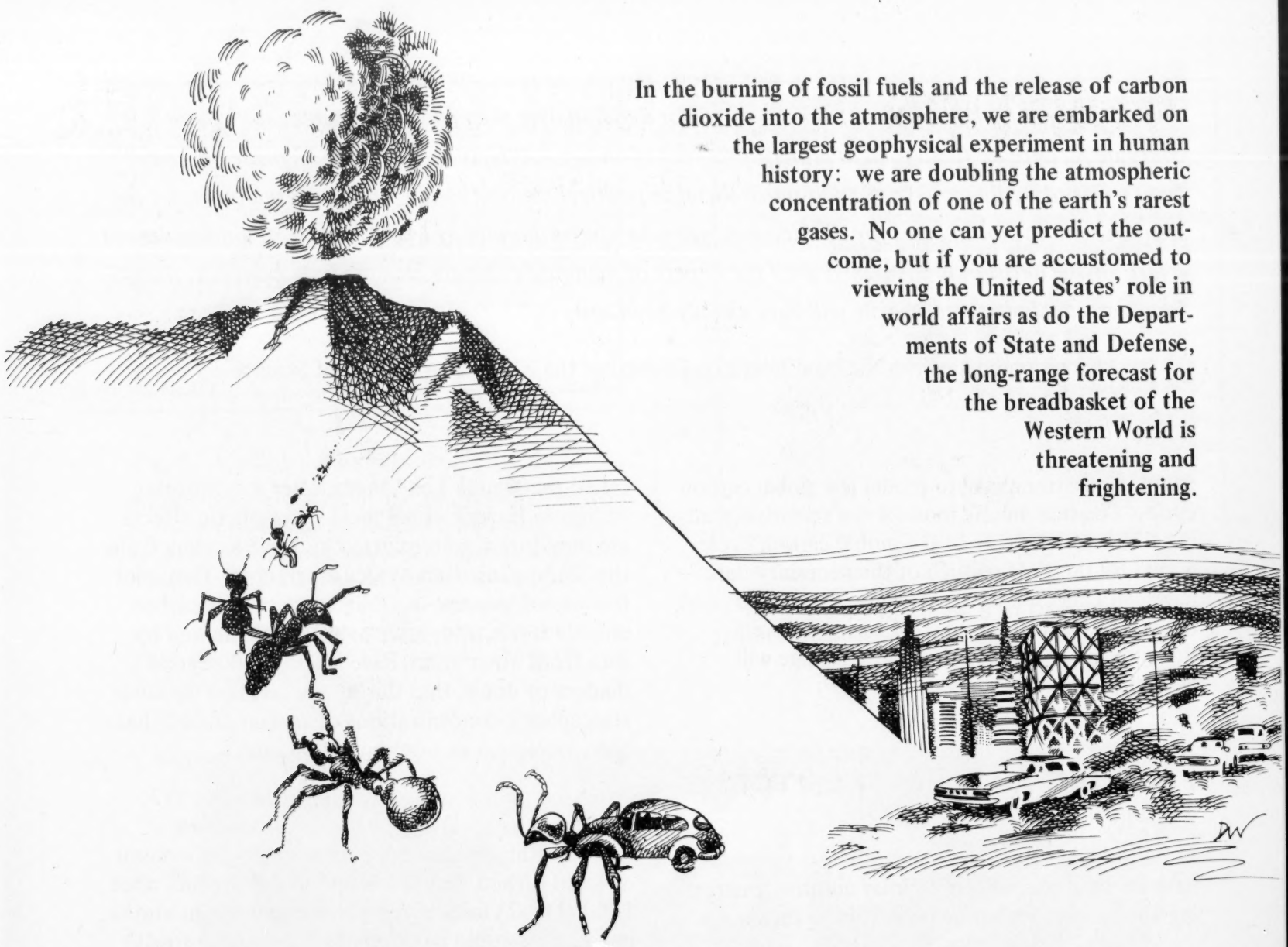
## EARTH

Enormous volumes of these organic molecules are fossilized in the earth. In the last 100 years, we have learned how to burn this material, rich in carbon, for fuel.

## AIR

The atmosphere of the earth is composed of a variety of gases (largely inert) that sustains life. One of the rarer gases is carbon dioxide (approximately 0.03 percent by volume), which, as it happens, is transparent to incoming shortwave radiation (solar isolation) but absorbent of outgoing longwave (infrared or heat) radiation.

ILLUSTRATIONS BY DAVID WILLS



**In the burning of fossil fuels and the release of carbon dioxide into the atmosphere, we are embarked on the largest geophysical experiment in human history: we are doubling the atmospheric concentration of one of the earth's rarest gases. No one can yet predict the outcome, but if you are accustomed to viewing the United States' role in world affairs as do the Departments of State and Defense, the long-range forecast for the breadbasket of the Western World is threatening and frightening.**

**There is an invisible ball with an enormous mass balanced on the edge of a steep incline, and many industrious ants are digging away underneath it. When the ball gets rolling, part of it will come down blue, part of it will come down green, but all of it will come down heavy.**

When the big picture is obscure, we construct models. Boatbuilders, for instance, make models to see how the hull will look before going to all the time and expense of laying up the big pieces of a boat. A good model can save time by eliminating big and expensive mistakes before getting to the final stages when it is Too Late.

Ecologists also construct models when the big picture of, say, the partitioning of carbon among living organisms, the earth, the air, and the oceans is obscure. Models are not reality; they only approximate reality. Because the sheer volume of global data is enormous; because there are so many variables for which there is limited information; because processes and transfers must be reduced to simple physical formulae; models can only suggest what is happening in the large sense.

The effect of burning fossil fuels on the global carbon cycle is like a ball with an enormously large mass (for instance 7,300 billion metric tons – the mass of carbon in recoverable fossil fuels) being pushed in one direction by a large number of small forces, none of which is very great relative to the mass of the ball. For our purposes, the ball is being pushed out of the ground, or lithosphere, where it has been stored for upwards of 200 million years, and into the atmosphere. Once the cumulative effort of the small forces acting on the enormous ball gets it rolling in one direction, it takes a correspondingly great force working in the opposite direction to stop the ball's movement. The greater its momentum, the harder it is to stop the ball. Further, imagine that once this ball starts rolling out of the earth and into the atmosphere, it becomes diffuse and invisible, and therefore difficult to follow. This, then, is the crux of the

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*Working and consulting forester (both), Philip Conkling early on realized how broad is the base of the craft he paid to know. That's how* Green *and* Blue *become the same subject here. While the earth physically circles the sun, the earth's basic lifegiving processes turn on the ocean, once the sun's had its say. Most of the time Phil practices his trade out of a boat, in Maine.*

*–Eds.*

*"Worldwide industrial civilization may face a major decision over the next few decades – whether to continue reliance on fossil fuels as principal sources of energy. A decision that must be made 50 years from now ordinarily would not be of much social or political concern today, but the development of the scientific and technical bases for this decision will take several decades of lead time and an unprecedented effort. If the decision is postponed until the impact of man-made climate changes have been felt, then, for all practical purposes, the die will have already been cast . . ."*

– From a report of the National Research Council of the National Academy of Science

problem of attempting to model the global carbon cycle. The fear among most of the scientists studying the different parts of the global carbon cycle is that by the time enough of the necessary data has been collected to construct more sophisticated models on which to base solid scientific predictions, a significant global climatic change will have already been induced.

## FROM THE GREENHOUSE EFFECT TO THE MISSING CARBON

In the decade since Earth Day, disaster scenarios have become part of our popular culture, generating a sense that we cannot control our fate.

While many of the other scenarios have come and gone, the threat that our climate will get warmer (known popularly as the Greenhouse Effect) has persisted. In the decade since the possibility of a significant increase of global temperature was first raised, a great number of scientists from a variety of different disciplines have examined the problem. The Department of Energy is concerned enough about the carbon dioxide threat to have recently created an Office of Carbon, whose director will have broad powers and will report directly to the Secretary. In scientific circles, the terms of the discussion have changed: studying the "Greenhouse Effect" has become an effort to locate the "Missing Carbon."

Two firm pieces of experimental data exist: Keeling's data on atmospheric carbon dioxide levels (Fig. 1) and the Oak Ridge data on the cumulative release of carbon dioxide from the burning of fossil fuels since the beginning of the Industrial Revolution (Fig. 2).

In 1958 a series of measurements were taken in remote areas of the globe to determine the change, if any, in the percentage of carbon dioxide in our atmosphere. The results, gathered now over 20 years, have produced a set of curves that may one day be as well known as the bell-shaped curve of mean and standard deviations. These curves, called the Mauna Loa Curves, after a monitoring station in Hawaii where local atmospheric effects are minimized, were plotted by Dave Keeling from the Scripps Institute of Oceanography. They plot the rate of increase in global atmospheric carbon dioxide levels, and, after being supplemented by data from other areas, have established beyond a shadow of doubt that during the last two decades atmospheric concentrations of carbon dioxide have been increasing at an exponential rate.

After the publication of Keeling's data in 1973, the government charged a group of scientists at the Oak Ridge Laboratory to estimate the amount of fossil carbon that has been burned for fuel since 1860 (Fig. 2) to determine if the increase in atmospheric $CO_2$ could be attributed entirely to fossil fuel burning or some other cause.

The correlation between the Mauna Loa and Oak Ridge curves is striking: both show exponential rates of increase in the last 20 years. These curves provide the first conclusive evidence that the burning of fossil fuels is responsible for the increase of atmospheric $CO_2$. However, only about half of the fossil carbon that has been burned since the beginning of the Industrial Revolution has remained in the atmosphere; the rest clearly is being cycled into other compartments. For the immediate future, the challenge is to account for the missing carbon (Fig. 3). Aside from the narrow scientific matter of locating the missing carbon, a number of other disturbing issues are raised by these curves:

1. The release of fossil carbon has been increasing at an exponential rate since the beginning of the Industrial Revolution 100 years ago.

2. We are well on our way to doubling the concentration of atmospheric $CO_2$.

3. That the changes or the magnitude of the changes cannot be predicted is *ipso facto* evidence that there is a problem. For the first time, our capacity to perturb the global environment has exceeded our predictive abilities. *[more →]*

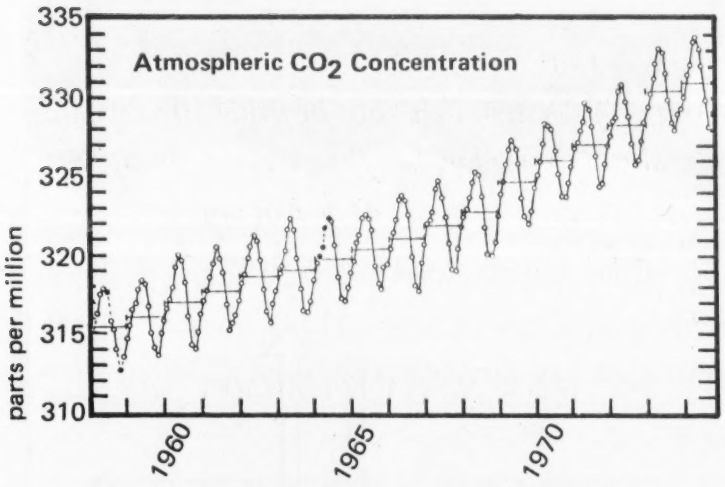



**Fig. 1: Keeling's Data on Carbon Build-up**

Monthly average values of the concentration of $CO_2$ in the atmosphere at Mauna Loa Observatory, Hawaii, are plotted since the beginning of accurate and regular measurements in 1958. Interpolated annual changes are shown as dots. Variations in photosynthesis and other seasonal effects produce the annual cycle. Mean annual concentrations are well above the pre-industrial level (290 - 300 ppm).

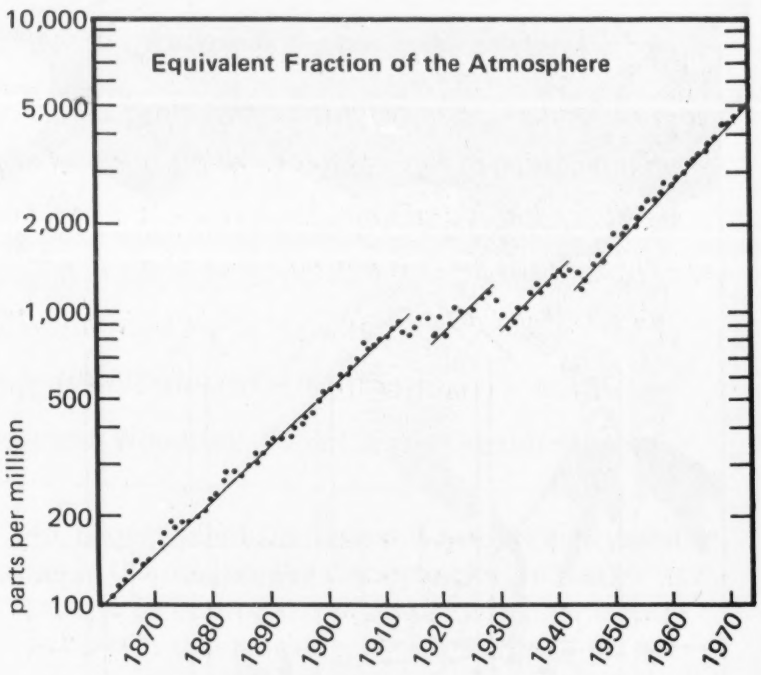



**Fig. 2: Global Production of $CO_2$, From Fossil Fuels and Cement, 1860 - 1976.**

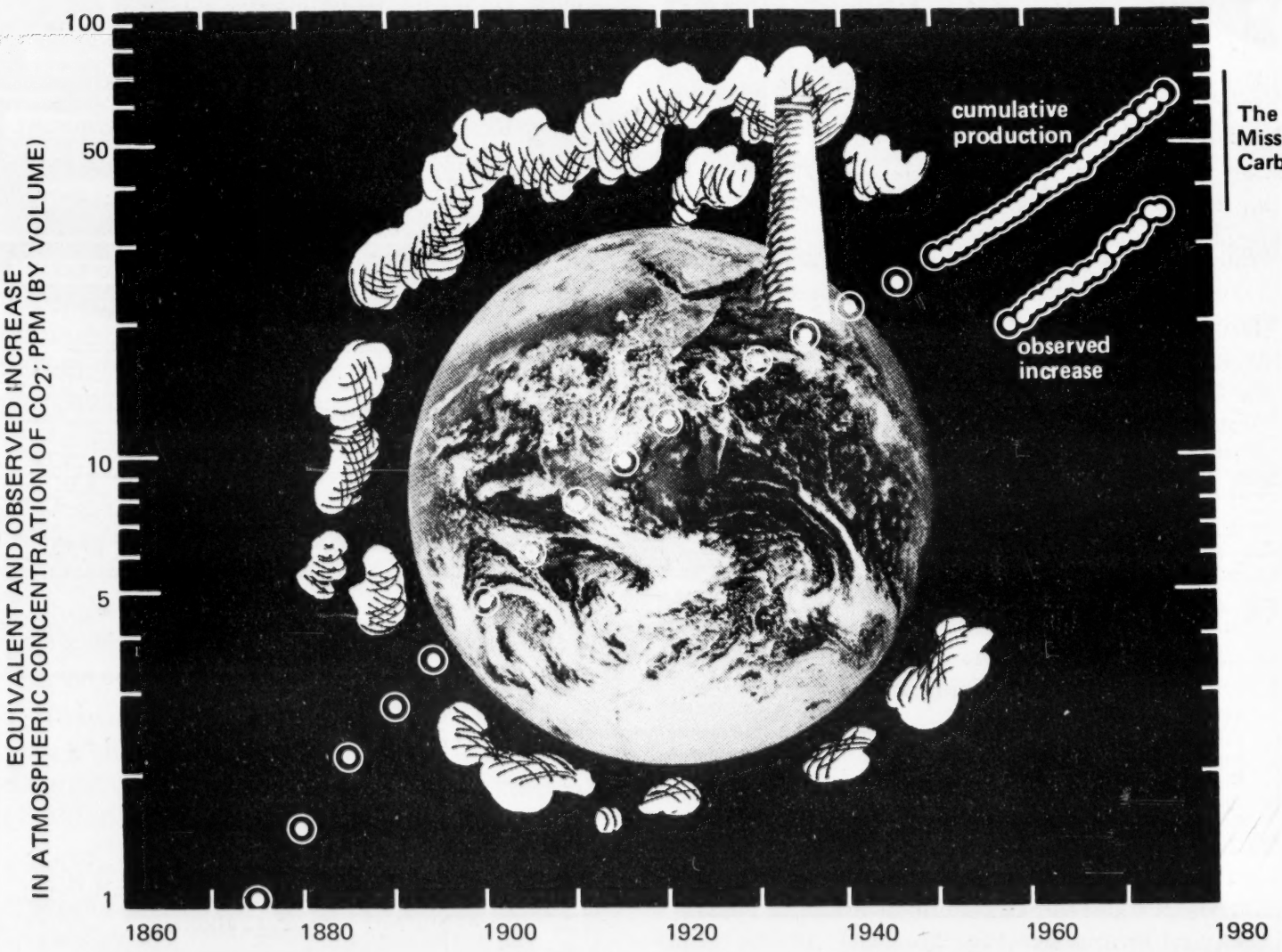



**Fig. 3: The Missing Carbon**

The cumulative production of $CO_2$ since 1860 (i.e., the summed changes from Fig. 1 expressed as the equivalent atmospheric concentration) is compared with the observed increase in the mean annual concentration (from Fig. 2) since that time. The similarity in the rates of increase (about 4% per year) provides strong evidence that these two quantities are related. About 50% of the fossil carbon flux apparently has been balanced, at least since 1958, by a flow of $CO_2$ to the oceans and/or the land biota. (The 1860 atmospheric concentration was assumed to be 295 ppm.)

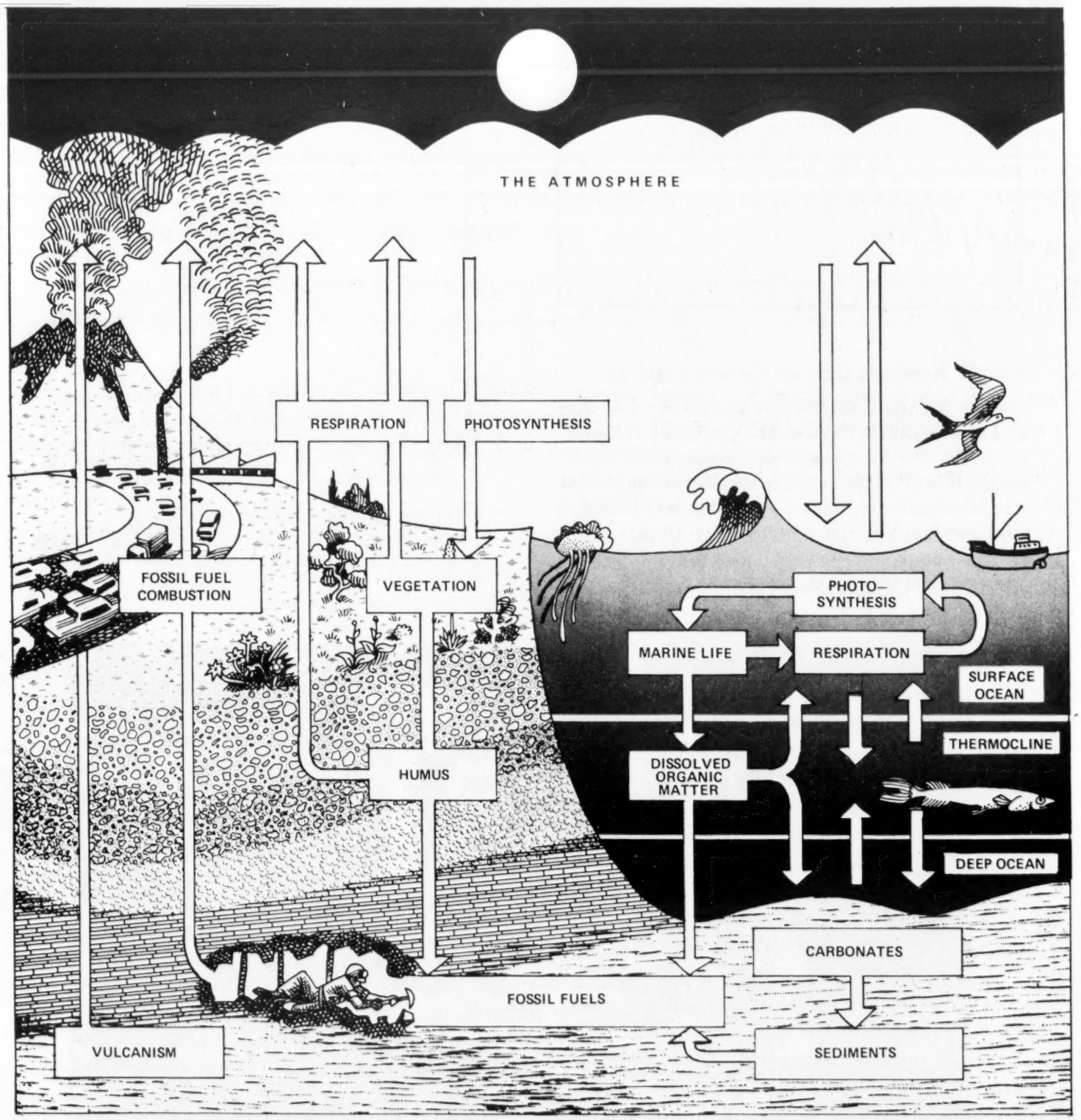



**Fig. 4: The Global Carbon Cycle.**

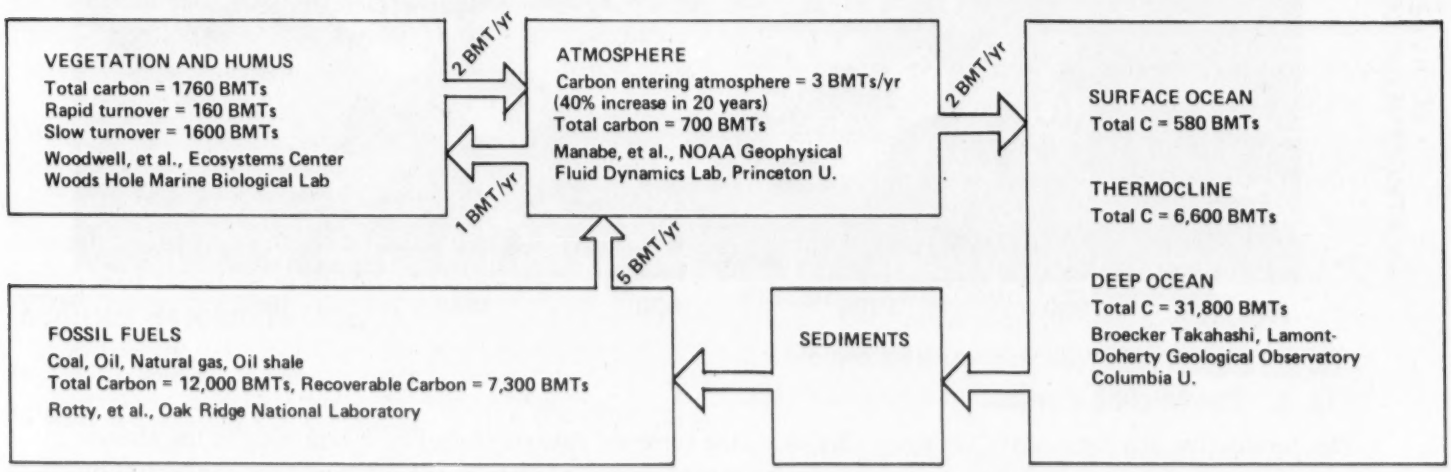



**Fig. 5.** Estimates of how much carbon is moving in what directions. The author says, "Careful academic scientists who are studying the problem are freaked out by the net amount of carbon entering the atmosphere — 3 billion metric tons per year." That's a 40% increase in 20 years. That figure is the only one in this chart commonly accepted by all experts. The others are estimates that are subject to dispute. Figures are expressed in Billion Metric Tons (BMTs).

*"The potential hazards associated with a steady increase in the carbon dioxide content of the atmosphere will loom large in the coming decades and will doubtless bear heavily on such decisions as whether to accelerate the development of power plants based on nuclear fuel instead of those based on coal and whether to preserve forest areas instead of encroaching on them (and, if the forests are to be preserved, how to provide the new lands that are almost certain to be needed for agriculture). There is almost no aspect of national and international policy that can remain unaffected by the prospect of global climate change. Carbon dioxide, until now an apparently innocuous trace gas in the atmosphere, may be moving rapidly toward a central role as a major threat to the present world order . . ."*

– From George Woodwell, "The Carbon Dioxide Question"

## SOURCES, SINKS, AND FLUXES: IS THE MISSING CARBON GREEN OR BLUE?

There are several models that describe the partitioning of carbon among its four major compartments: the atmosphere, the hydrosphere (mainly the oceans), the biosphere (living plants and animals), and the lithosphere (the earth, where the carbon is primarily stored in fossil fuels). In constructing any nutrient cycle, different compartments act as temporary *sources* or *sinks*. Salt marshes, for instance, in the United States act as important sinks for heavy metals, which are cycled through the atmosphere from their source – automobile emissions. Nutrient cycles are dynamic, and most portions of the cycle involve *fluxes* in both directions. In the example of salt marshes, a great deal of the sulfur from automobile emissions is washed out of the air by rainfall; much of it drains into salt marshes through the action of anaerobic bacteria in the sediments. A portion of this sulfur is recycled into the atmosphere as hydrogen sulfide (marsh gas). However, the important point is that the *net flux* is from the atmosphere into the marshes and not vice versa. See Figs. 4 and 5; the values in the diagram in Fig. 5 are expressed in billions of metric tons (BMTs or $10^{15}$ grams).

Several important facts are illustrated in Figs. 4 and 5:

1. The amount of carbon in recoverable fossil fuels is about 10 times the amount that exists in the total global atmosphere as carbon dioxide (7,300 BMTs vs. 700 BMTs).

2. The relatively small amounts of carbon in the atmosphere (700 BMTs) can be appreciably increased by relatively small changes in the net fluxes between other sources and sinks of the carbon cycle.

3. On the basis of the data available, the estimates of various models show discrepancies; that is, the sources appear to be larger than the sinks. Better data and better models are obviously necessary to account for the missing carbon.

4. Though all of the carbon is not yet accounted for in the models, the discrepancies are small relative to the amount of fossil carbon we intend to burn in the remainder of this century.

One of the unique aspects of the attempt to model the global carbon cycle is the extraordinary communication effort that has been necessary among different scientific disciplines. Atmospheric scientists working on the global carbon cycle are particularly good at modelling gas-diffusion rates. The physical oceanographers are primarily chemists who have studied how and how fast carbon is entering the sea. The terrestrial ecologists are attempting to model not physical or chemical processes, but complex biological transfers. They are dependent on the poorest data base, and not surprisingly their part of the carbon cycle model is subject to the greatest uncertainties. No doubt as the data improves as a result of the greatly increased (government-funded) research, the various estimates will begin to converge and the uncertainties will diminish. Fig. 5 shows some of the major sources of scientific thought in the study of the global carbon cycle – particularly those that were instrumental in the preparation of this article.

## THE OCEAN SINK: IS THE MISSING CARBON BLUE?

If 50 percent of the carbon dioxide that has been released since the beginning of the Industrial Revolution has remained in the atmosphere, the rest of it has gone somewhere, and clearly, the oceans are an important sink.

In the first decade of the search for the missing carbon, significant advances have been made in understanding the incredibly complex chemistry of the oceans. Oceanographers have now described the broad outlines of the two most important processes that determine how atmospheric $CO_2$ is incorporated into seawater; i.e., the details of (1) the carbonate-bicarbonate buffer system and, (2) vertical mixing rates and current flows.

The capacity of oceans to take up carbon dioxide is regulated by the amount of the carbonate ion

in seawater, and the estimates for the total abundance of carbonates in the world's oceans are, at first glance, reassuring: there are enough carbonates to absorb all the carbon dioxide that we would produce if we burned all recoverable fossil fuel reserves. Incorporated primarily in calcium sediments on the upper slopes of underwater mountain chains (such as the mid-Atlantic Ridge), carbonate deposits are continually built up from the sinking of the skeletons and shells of microscopic marine organisms. Oceanographers have poetically described these deposits as being like the "snow limit" in mountain country during the winter.

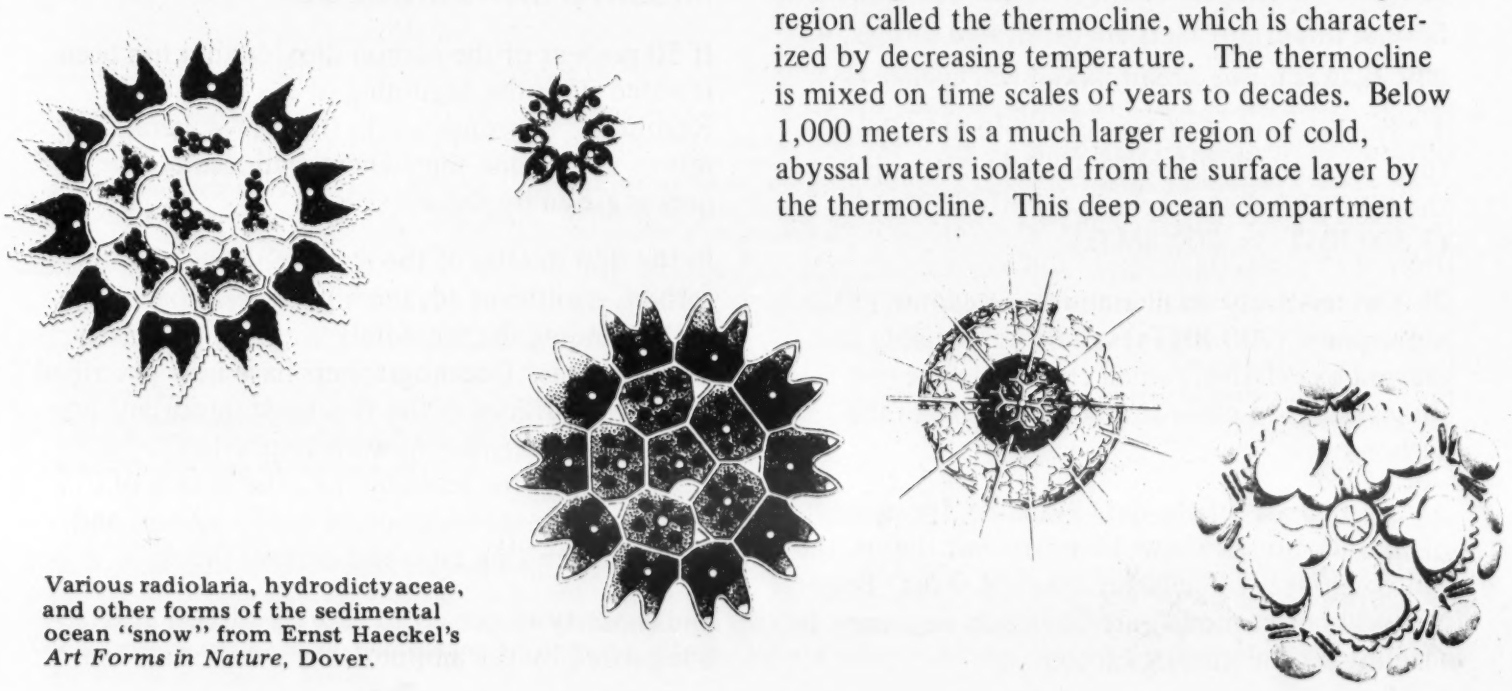
But below a given limit (approximately 1,500 feet) in most oceans, seawater becomes progressively more corrosive to the sinking carbonate skeletons. The snow dissolves and eventually is recycled to the surface waters. When carbon dioxide is incorporated in seawater, it combines with dissolved carbonate ions and forms a weak carbonic acid, which increases the corrosiveness of seawater, which then dissolves even more carbonate out of the calcium sediments. Therefore, the effect of increasing the atmospheric concentrations of $CO_2$ should result in the melting of more calcium carbonate sediments and a higher "snow limit" on underwater mountain slopes. The carbonate-bicarbonate buffer system acts as a positive feedback loop: the more carbon dioxide that dissolves, the more that can dissolve. Eventually, all the $CO_2$ that is produced by the burning of fossil fuels would wash into the soupy salts of the sea.

If it were not for two very important caveats (the Revelle factor; and mixing rates), there should be nothing at all to worry about. The surface waters of the oceans presently contain an amount of carbon dioxide comparable to that in the atmosphere. Because of the equilibrium chemistry of the ocean-atmosphere interface, carbon dioxide is very much favored to stay in the atmosphere – by a factor (called the Revelle factor) of 10 times. Another way of saying this is that to produce an increase of 1 percent in the total dissolved carbon dioxide content in surface seawater, the partial pressure of $CO_2$ in the atmosphere must first rise by 10 times this amount. Over time, the Revelle factor can change as the increasing corrosiveness of seawater dissolves more calcium carbonate on the seafloor.

But then the mixing rate of surface waters with deep ocean waters becomes the critical factor.

Before the early 1970s, oceanographers had only the crudest ideas of what the vertical mixing rate of the oceans might be. Then several people realized that measuring the depth to which radioactive hydrogen (tritium) – released by the atmospheric testing of thermonuclear devices – provided a convenient means to estimate it. (There's a silver lining in every thermonuclear cloud?) In the years since tritium rained into the oceans in the early 1960s, it has sunk to depths of 5,000 meters. Everyone was surprised at how fast it sank.

The bomb data has allowed oceanographers at Columbia University's Lamont Geological Laboratory to model how the oceans circulate. The surface layer of the oceans, extending to an average depth of 70 meters, are heated by the sun and stirred enough by the winds and tides to be relatively well mixed. Beneath this surface layer, extending to a depth of 1,000 meters, is a stagnant region called the thermocline, which is characterized by decreasing temperature. The thermocline is mixed on time scales of years to decades. Below 1,000 meters is a much larger region of cold, abyssal waters isolated from the surface layer by the thermocline. This deep ocean compartment



Various radiolaria, hydrodictyaceae, and other forms of the sedimental ocean "snow" from Ernst Haeckel's *Art Forms in Nature*, Dover.

is mixed on time scales ranging from centuries to millennia. At high latitudes, however, where surface waters are sufficiently cooler and heavier, the thermocline density gradient breaks up, and surface waters sink to produce a worldwide circulation pattern where water descends at the poles and upwells near the equator.

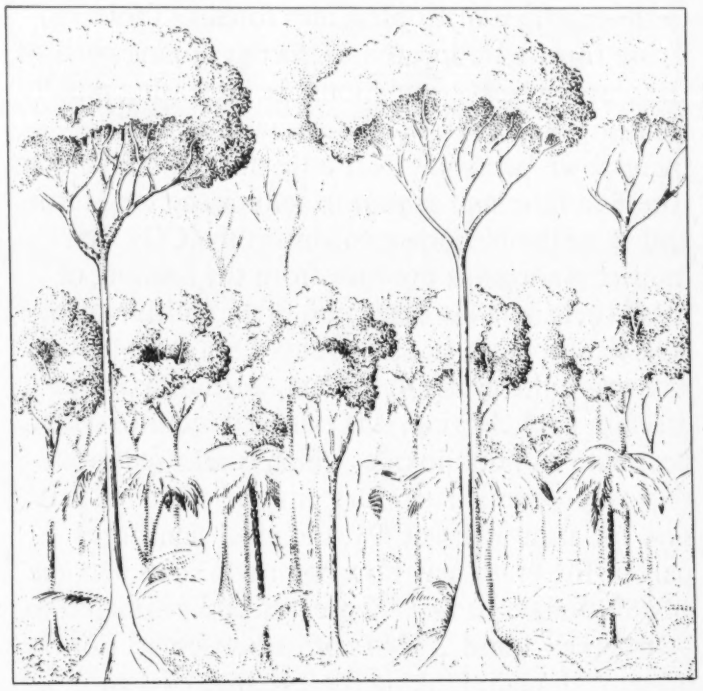
There are seasonal and geographical variations in the rates that $CO_2$ can dissolve in the ocean for which the Lamont circulation model does not yet account. For instance, because the partial pressures of $CO_2$ in air and water vary with temperature, $CO_2$ "boils off" at equatorial latitudes and condenses in higher latitudes. In fact, near the poles, the bomb data indicates that atmospheric carbon dioxide literally cascades to great depths because of the sinking of undersaturated cold water. This high-latitude cascade or waterfall of carbon dioxide may be the the most important route by which $CO_2$ is cycled out of the air and into the sea.

But on the whole, the oceans of the world are mixed at a rate of between 2 and 8 percent of the surface waters per year, so that the oceans "turn over" only once every 500 to 2,000 years. Even under the most optimistic and unrealistic models of oceanic mixing, seawater uptake cannot solve the $CO_2$ problem. We are looking at a 100-year problem with an ocean that can respond on a 1,000-year horizon.

What is worse, if increased atmospheric concentrations of $CO_2$ lead to a warming of average global temperatures, there will be a comparable warming of the upper layers of the ocean, forming a lid of relatively warmer water over deep, cold waters, increasing the vertical density stratification and inhibiting the stirring and mixing processes, which up to now have helped to damp the Greenhouse Effect.

The figures in the ocean model will change as greater effort is concentrated on determining how different ecosystems contribute to the $CO_2$ cycle. For instance, shallow water sediments (like coral reefs) and river systems must be soaking up a portion of the missing carbon. But according to the Broecker-Takahashi model, the oceans simply cannot account for all the missing carbon.

Some of it, therefore, must be green.



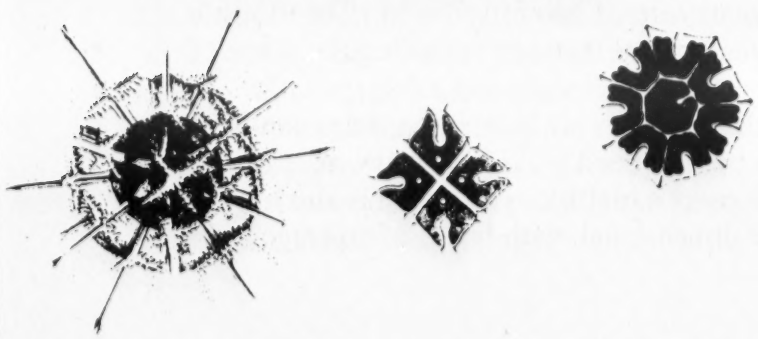
From LIFE ON EARTH, Sinauer Associates, 1973

## THE GREEN FLUX

The most accurate figures in the missing carbon equation are (1) the amount released by the worldwide burning of fossil fuels (5 BMTs/year) – from Oak Ridge calculations; (2) the increase in the $CO_2$ content of the atmosphere (2.3 BMTs/year) – from the Mauna Loa curve. The remaining 2.7 BMTs must be sequestered in the oceans and/or the biosphere. The transfer of carbon dioxide from the atmosphere through the surface water of the oceans and into the deep ocean appears capable, for the immediate future, of explaining the fate of most of the missing carbon (between 2 and 2.5 BMTs/year). It has been assumed that the remainder of the missing carbon is being sequestered in the totality of living matter – the biosphere.

The Mauna Loa curve shows a systematic oscillation in the $CO_2$ content of the atmosphere that is correlated with the seasons (high $CO_2$ concentrations in late winter, low in late summer). Undoubtedly this corresponds to the photosynthetic pulse, which occurs when green things grow during the summer in the middle latitudes of both hemispheres. The conclusion is obvious: the biosphere plays an important role in atmospheric carbon fluxes.

In January of 1978, George Woodwell and his colleagues at the Ecosystems Center of the Marine Biological Laboratory in Woods Hole, Massachusetts published a paper in *Scientific American* that had a very sobering effect on those engaged in global carbon budgeting. By using data compiled by Whittaker and Likens of Cornell University, Woodwell pointed out that the largest pools of carbon in



the biosphere are contained in forests – primarily in the big trees of tropical rain forests (Table 1). These forests are located in the developing parts of the world where populations are increasing rapidly, resulting in accelerated deforestation and the increase of farmland. Not only does the shift from forest to farmland appear to reduce the long-term ability of the biosphere to absorb the $CO_2$ that industrial societies produce from the burning of fossil fuels, but the extension of agriculture into soils that contain large amounts of organic matter will speed the decay of humus. As humus is oxidized in land clearing, it is transformed into water, heat, and carbon dioxide, which is released into the atmosphere. Therefore, instead of acting as a *sink* for atmospheric $CO_2$, the most significant part of the biota may now be or will soon become an additional *source* – conservatively estimated to be between 1 and 2 BMTs of carbon/year. For the present, though, looking for a change of 1 to 2 BMTs/year in the total, a standing crop of 1,700 BMTs (the amount of total carbon sequestered in the biosphere) is beyond the sophistication of our measurements.

As a result, there are still large uncertainties in the role that the biosphere has played in the carbon cycle. Some have argued that the effect of atmospheric $CO_2$ releases has been to fertilize the biota, since carbon dioxide is known to be one of the most limiting factors in photosynthesis. They point out that if the living biomass of the earth increased by 1 percent annually, this growth would more than offset the annual production of carbon dioxide from the burning of fossil fuels. If, on the other hand, biomass is being reduced by human activities, the release of $CO_2$ into the atmosphere from this source could be equal to the amount released through fossil fuel consumption. But one thing is certain: if we burn fossil fuels at an accelerated rate, the uncertainties in the terrestrial carbon flux won't matter. The terrestrial biota won't be able to balance the budget, since the maximum possible increases in biomass are small compared to the total mass of fossil carbon we will consume.

## THE TEMPORARY AND INVISIBLE ATMOSPHERIC SINK

Global temperature is basically determined by the balance between the amount of energy reaching the earth's surface from the sun and the amount reflected back into space. Several factors can influence the amount of sunlight hitting the earth, including ozone, cloud cover, and the volume of dust in the atmosphere. But none of the variables that control global temperature is as important as the effect of atmospheric $CO_2$, which is very strongly opaque to radiation in the infrared portion of the spectrum. Until now, the increases in $CO_2$ levels have been so small that, according to Rotty (1978) at the Oak Ridge Laboratory, they should have contributed only one- or two-tenths of a degree of warming – an amount that would be easily masked within the limits of natural climatic variability.

A group of atmospheric physicists at the National Oceanographic and Atmospheric Administration's (NOAA) Geophysics Fluid Dynamics Laboratory in Princeton, New Jersey, led by Syukuro Manabe has been developing a highly sophisticated climatic model. The ideas behind this model were developed about 25 years ago by a theoretical physicist and mathematical genius named Von Neumann. Von Neumann developed a computer language based on the binary system, and one of its uses was to predict tomorrow's weather patterns based on how such physical processes as thermodynamic laws and equations of motion interact to create today's weather. Von Neumann assembled a group of young meteorologists at Princeton's Institute for Advanced Study (the place where Einstein closed out his academic years) who have spent 20 years perfecting the model. His system, called numerical weather prediction, is not an *analog* model (which is a statistical-empirical method that tries to predict tomorrow's weather based on a study of historical patterns and fluctuations), but a model based on the laws of physics – as long as the laws are sound, the model will simulate reality.

Basically, the model uses a grid system of thousands of stations across the face of the globe and programs in temperature, wind, pressure, and moisture for each station. Since weather changes should follow the laws of physics, if you know where you are today, you should be able to predict what will be happening on a global scale tomorrow. In fact, this approach is very good at simulating global, rather than regional, weather patterns, though the accuracy breaks down after 2 to 3 weeks, since small uncertainties are magnified as time passes.

This grid-system approach to weather forecasting has become enormously more sophisticated over the years since it was introduced. The location of geographical features, including the shape of major mountain ranges and a determination of which gridpoints are located on the ocean have been programmed in, as have snow mass and snow cover variables. The model is also now three-dimensional, with layers of grids reaching

**Table 1**

Major plant communities of the earth are listed along with their area, their net primary production and the amount of carbon they hold in storage. Net primary production is the amount of carbon a plant community provides annually for harvesting or for the support of various consumer organisms, either wild or domesticated. Although only about 30 percent of the earth's surface is covered by land, the net primary production of terrestrial vegetation is slightly more than twice the primary production of the oceans. The quantity of carbon stored in land plants is some 500 times greater than the quantity stored in marine ecosystems. The carbon stored in trees is roughly equal to the carbon in the atmosphere. The figures in the table were recently compiled by R.H. Whittaker and Gene E. Likens of Cornell University.

| | Area ($10^6$ square kilometers) | Net primary production ($10^{15}$ grams of carbon per year) | Plant mass ($10^{15}$ grams of carbon $10^{15}$ grams = 1 BMT) |
|---|---|---|---|
| Tropical rain forest | 17.0 | 16.8 | 344.0 |
| Tropical seasonal forest | 7.5 | 5.4 | 117.0 |
| Temperate evergreen forest | 5.0 | 2.9 | 79.0 |
| Temperate deciduous forest | 7.0 | 3.8 | 95.0 |
| Boreal forest | 12.0 | 4.3 | 108.0 |
| Woodland and shrubland | 8.5 | 2.7 | 22.0 |
| Savanna | 15.0 | 6.1 | 27.0 |
| Temperate grassland | 9.0 | 2.4 | 6.3 |
| Tundra and Alpine meadow | 8.0 | 0.5 | 2.3 |
| Desert scrub | 18.0 | 0.7 | 5.9 |
| Rock, Ice and Sand | 24.0 | 0.03 | 0.2 |
| Cultivated land | 14.0 | 4.1 | 6.3 |
| Swamp and Marsh | 2.0 | 2.7 | 13.5 |
| Lake and stream | 2.0 | 0.4 | 0.02 |
| Total Continental | 149.0 | 52.8 | 826.5 |
| Open ocean | 332.0 | 18.7 | 0.45 |
| Upwelling zones | 0.4 | 0.1 | 0.004 |
| Continental shelf | 26.6 | 4.3 | 0.12 |
| Algal bed and Reef | 0.6 | 0.7 | 0.54 |
| Estuaries | 1.4 | 1.0 | 0.63 |
| Total Marine | 361.0 | 24.8 | 1.74 |
| World Total | 510.0 | 77.6 | 828.0 |

all the way up into the stratosphere. The variables from every gridpoint are cranked into the system and then posited into three dimensions. Every time the program encounters a new temperature value, for example, all variables are recalculated in terms of the new value; this is done every 10 minutes.

The model is run on a large computer, which was the second fastest in the world when it was installed. Still, it takes many hours of computer time to run a single "experiment," and when more geographical information is included, the run time necessary will increase radically. Clearly, this general circulation model of the atmosphere is pushing the limits of available computer technology.

If a model simulates reality well, you begin to trust it; and, in fact, this model has been very successful in reproducing the location and direction of the jet stream, and such climate-related features as the location of tropical rainbelts and the distribution of major deserts across the face of the globe. The tundra and polar icecaps are accurately mapped. The vast grasslands of East Africa and the mid-western prairies of the United States are just where they should be. There are, to be sure, some inaccuracies. The Mexican Sonoran Desert reaches too far north and swallows up part of Texas, and the Indian subcontinent is simulated to be drier than it actually is. But on the whole, the predictions of the model are remarkable in their fidelity to the big picture.

*more*➔

## RUNNING THE GENERAL CIRCULATION MODEL AT 2 x $CO_2$

A few years ago scientists saw that the numerical weather prediction model might be used to predict what might happen to the global climate if the level of $CO_2$ in the atmosphere were doubled. The preliminary results from such an experiment are, to say the least, disturbing.

As described above, when the general atmospheric circulation model is run at current levels of $CO_2$, the model closely simulates the kind of global climate we have today. But when the same experiment is run at double the level of $CO_2$, a distinctly different climate results. The changes of temperature at the equator would most likely be on the order of 1 to 2° C, really not very much. But temperature and precipitation changes are not uniform. Warm air heated at the equator rises and moves poleward. Warmer air takes longer to cool and sink, and will therefore move farther poleward. The amount of precipitation that warm air can hold varies exponentially with the temperature. As the atmosphere is warmed, it will be able to hold much more moisture, which will also be carried farther poleward.

The location of the major deserts (Sahara, Gobi, Sonoran, for example) at approximately 30° North and South latitudes would therefore likely move gradually poleward by as much as ten degrees. The ability of the air to hold more moisture also reduces the radiative heat loss to space, which acts to heat up further the whole dynamics of the system. The model predicts that winter would warm up much more than summer, reducing seasonal amplitudes. With warmer temperatures in winter, less snow would be produced at high latitudes and a highly reflective snow surface would be replaced with a very much less reflective soil surface. The reduction in the reflectivity (or albedo) at high latitudes has a magnifying effect, so that the average temperature changes at high latitudes will be as much as three times greater than those at low latitudes.

If the model is correct and global precipitation belts move poleward, polar water will be less saline, meaning that it will be less dense. It will almost certainly be warmer, thereby reducing the sinking rate of cold water at high latitudes, which is currently one of the most important means of dissolving $CO_2$ in the ocean. As polar air warms, thermal gradients are reduced so that winds would be less strong. Ocean circulation would therefore tend to slow down, and the seas would be able to take up even less $CO_2$. It also seems likely that a lid of relatively warm water would form over deeper cold waters, increasing the vertical density stratification of the oceans and further inhibiting the mixing and stirring processes by which carbon dioxide is dissolved in seawater. In addition, an increase in ocean temperature would raise the partial pressure of $CO_2$ in the water by 30 percent so that, after equilibration with the atmosphere, the $CO_2$ content of the air would increase by some 17 percent. Carbon dioxide would literally begin to "boil" out of the ocean.

The pronounced warming near the earth's surface at high latitudes may result in the gradual melting of the polar ice caps and may produce a higher sea level. Because of other changes in the pattern of precipitation, it appears that snowfall in Greenland and Antarctica would greatly increase. In Antarctica this would result in substantial increases in the thickness of shelf ice, increased horizontal stresses at the base of the shelf, and the possibility of an avalanche of shelf ice into the sea, such as the one that occurred 120,000 years ago and caused a rapid rise in sea level of about 5 meters.

There is much natural variability from year to year in such global climatic functions as temperature and precipitation. The statistical fluctuation in climate over time is referred to as "climatic noise." The extent and rate of the natural fluctuations are not entirely known, but since 1940 we have been in a slight cooling trend with a greater variability of weather. But even taking into account "climatic noise" and the present cooling trend, all the long-term estimates are for an increase in global average temperature; none are for a decrease.

As we increase the amount of $CO_2$ in the atmosphere, there is, then, a *distinct* probability (speaking statistically as meteorologists must) that global temperatures will increase. The questions are first, where; second, how much; and third, how do we minimize the shock to the system? Quite obviously we need to know much more to be able to answer these questions. The current models, which are at the limits of technological sophistication, are still woefully inadequate. In particular, Manabe's general circulation model has to be coupled with the Broecker-Takahashi ocean circulation model. Meteorologists will also have to devise a means of simulating cloud feedback mechanisms, since as many atmospheric scientists have pointed out, with increased temperature and precipitation, evaporation will also increase. With more moisture in the air, average cloud cover in some places will increase and act as a negative feedback.

It appears that 60 to 70 percent of the changes will occur within the first ten years after the doubling of atmospheric $CO_2$ levels. Then the rate of change will begin to decrease as carbon is eventually exchanged with the deep ocean compartment and perhaps with the biosphere (terrestrial forests).

No doubt changes to some parts of the globe will be beneficial. The Russians, for instance, apparently happily envision planting sugar cane in Siberia. Saudi Arabia might well become arable land.

The simulation of climatic changes over the United States still leaves much to be desired. The risk to the U.S., of course (aside from the very expensive nuisance of having to rebuild substantial portions of coastal cities), is that the corn and wheat belts would move northward into Canada. Perhaps a good deal of the deep soils of the upper Midwest would be blown onto the western slopes of the Appalachians. Worldwide food production would almost certainly drop at least until new crop varieties, adapted to the young, coarse, acidic soils of the north, could be developed. Even the most sober government scientists believe that the effects of climate may well become apparent suddenly and grow out of control before remedial actions and institutional changes, not to mention balance-of-power politics, become effective.

The changes in global climate described above depend on when the level of carbon dioxide doubles in the atmosphere, which in turn depends on the rate at which we burn our fossil-fuel reserves. Most of the estimates predict that $CO_2$ levels will double near the year 2000. In other words, during our lifetime.

## THE CARBON CYCLE AND NATIONAL ENERGY POLICY

Over 97 percent of the world's energy demand is met by burning conventional fossil fuels, and the United States currently consumes a little less than a third of this energy. Even if a policy of converting to other costly energy sources is vigorously pursued, the annual world consumption of fossil fuels is likely to double by the year 2000, doubling atmospheric carbon dioxide levels shortly thereafter. If the model developed at the Geophysical Fluid Dynamics Laboratory is correct, the United States is one of the regions of the world whose climate may change dramatically for the worse, since it appears likely that as precipitation belts move northward, the Mexican Sonoran Desert will encroach upon the corn and wheat belts of the Midwest.

The two key factors over which we have some means of minimizing the effects of climatic warming are (1) the types of fossil fuels we burn, and (2) the rate at which they are burned. Different forms of fossil fuels release significantly different amounts of carbon dioxide per unit of energy output. Natural gas contributes the least; coal and synthetic fuels derived from coal the most.

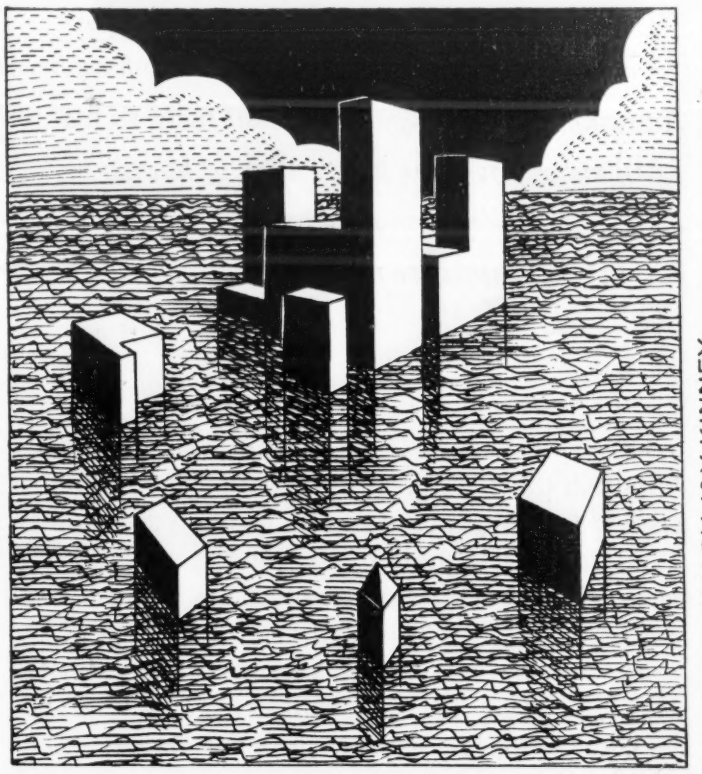


ILLUSTRATION BY JAY KINNEY

Table 2

$CO_2$ Produced From Fossil Fuels
Per Unit Energy Output (Rotty, 1978)

| Fuel | kg C/ 106 BTU | Ratio to natural gas |
|---|---|---|
| Natural gas | 14.4 | 1.0 |
| Oil | 19.0-21.7 | 1.32-1.5 |
| Coal | 25.4 | 1.74 |
| Synthetic fuel (75% efficient conversion) | 33.8 | 2.35 |

President Carter's original National Energy Plan relied heavily on increasing national coal production to insure adequate future energy supplies. If this plan is implemented, the U.S. will have increased its $CO_2$ production by two and one-half times, equalling the present total global carbon dioxide production.

The other key factor in the effects of the carbon cycle on climatic change is the *rate* of fossil-fuel consumption. We could burn the world's total fossil-fuel supply without greatly altering global climatic patterns if we did so gradually, say over 1,000 years, to allow the slowly moving oceans time to absorb the excess carbon dioxide. But if present rates of consumption continue, more than half of all fossil carbon will be released in the next 100 years. By slowing the rate of consumption, we buy the necessary time to perceive the effects before it is too late.

*more →*

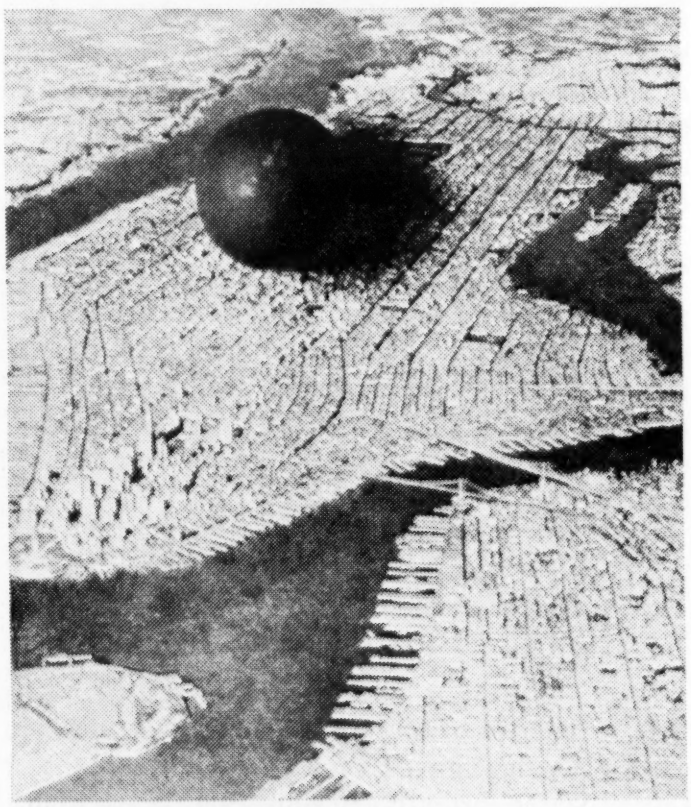
*"It is difficult for people living now who have become accustomed to steady exponential growth in the consumption of energy from fossil fuels, to realize how transitory the fossil fuel epoch will prove to be when viewed over the longer span of human history. . . . The period that encompasses most of the [fossil fuel] production is notably brief. The 102 years from 1857 to 1959 were required to produce the first half of the cumulative production; only the 10-year period from 1959 to 1969 was required for the second half."*

– M. King Hubbard, "Energy Resources of the Earth"

Although there are great uncertainties in every aspect of attempting to model the global carbon cycle, and although no model can yet predict the exact climatic effects of doubling the level of carbon dioxide, models do indicate the magnitude of the problem now confronting us. In the future, all energy policy decisions will have to address the question of what is happening to the global carbon cycle.

Those who favor the development of nuclear power are likely to see $CO_2$ problems as an argument in their favor. As one of the scientists involved in carbon research suggested, after Three Mile Island, even a runaway nuclear reactor is more subject to control than a drought in the Midwest. But to those opposed to nuclear power, the implications of the carbon cycle are likely to add an additional note of urgency for developing alternative (primarily solar) energy sources, since there is now more reason and less time to do so. Nothing has changed, the stakes are just higher.

There is an invisible ball with an enormous mass balanced on the edge of a steep incline, and many industrious ants are digging away underneath it. When the ball gets rolling, part of it will come down blue, part of it will come down green, but all of it will come down heavy. ■

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A SHORT HISTORY OF AMERICA~~
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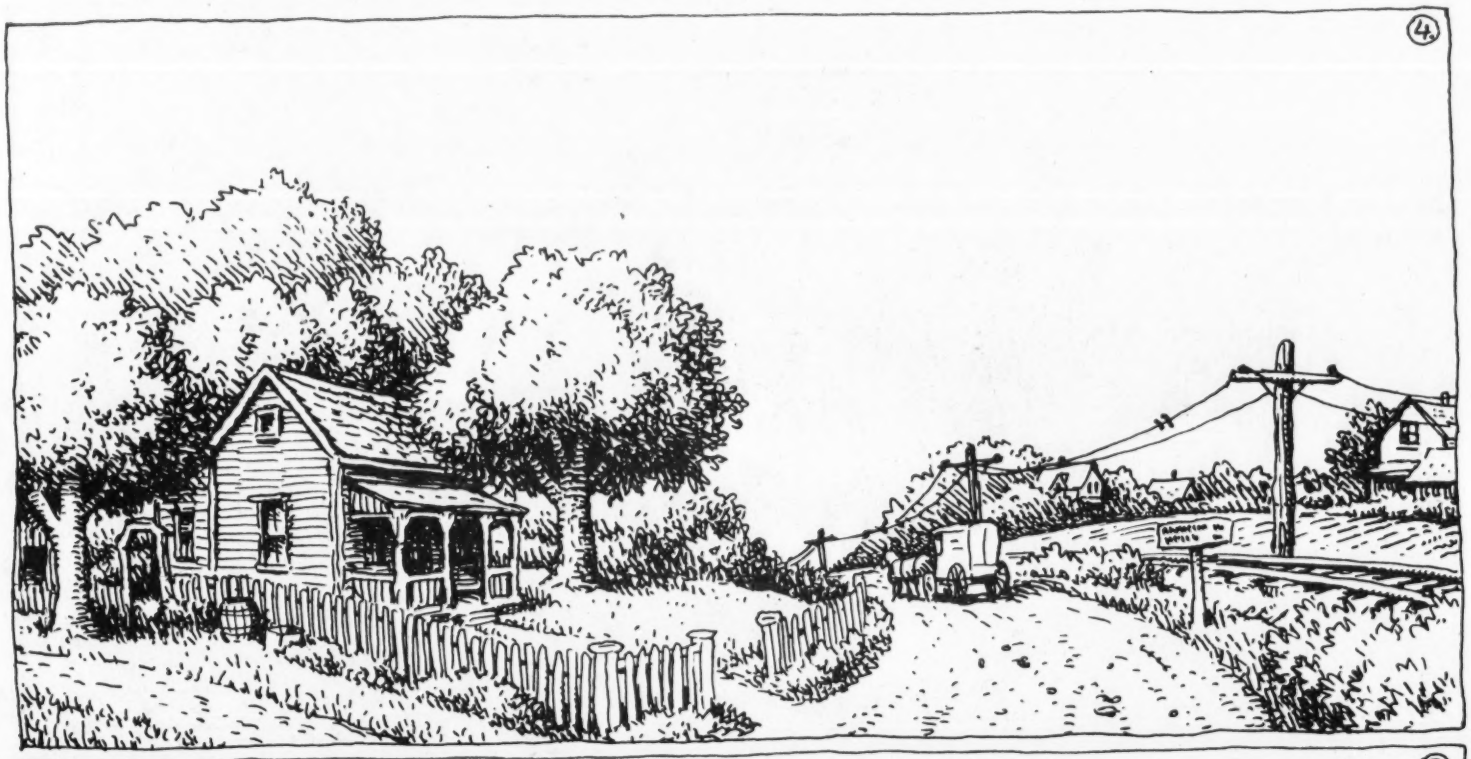
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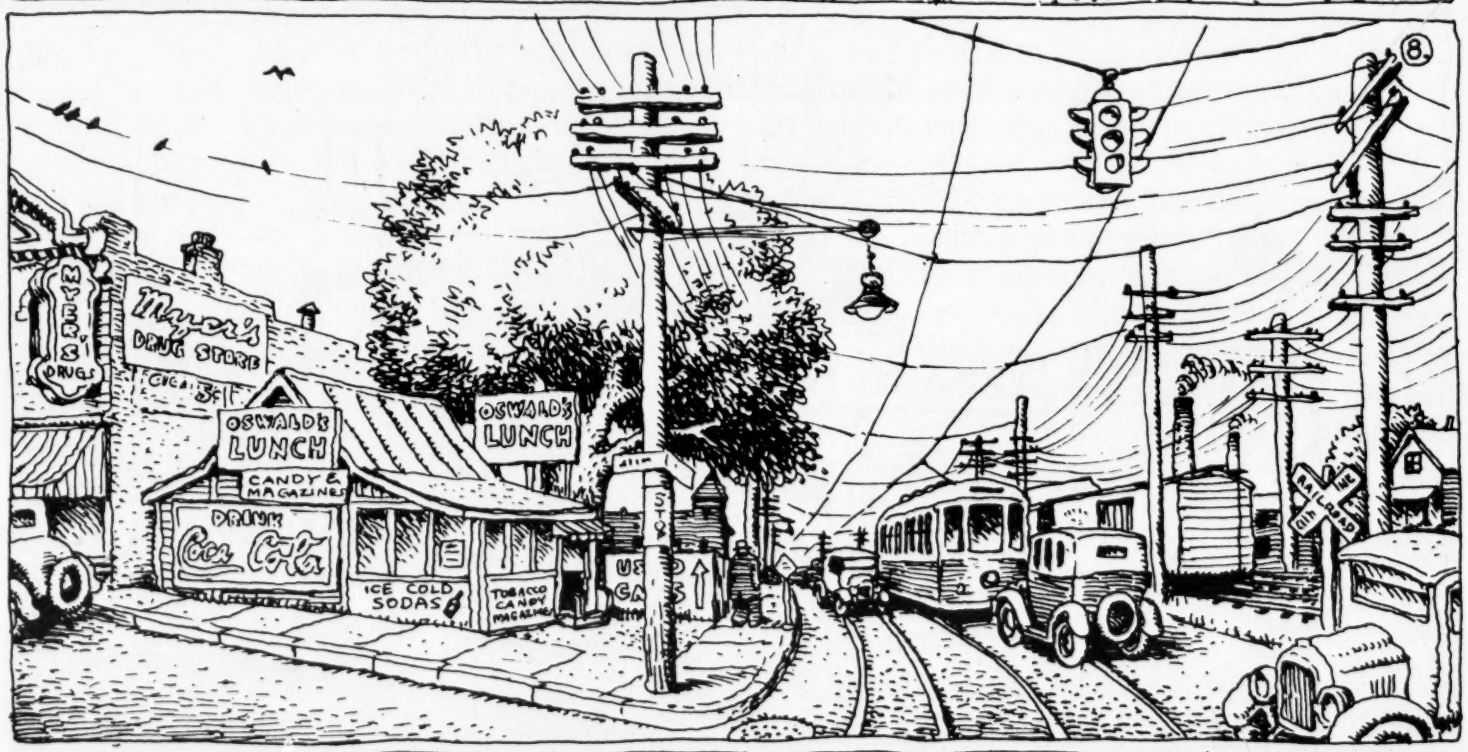
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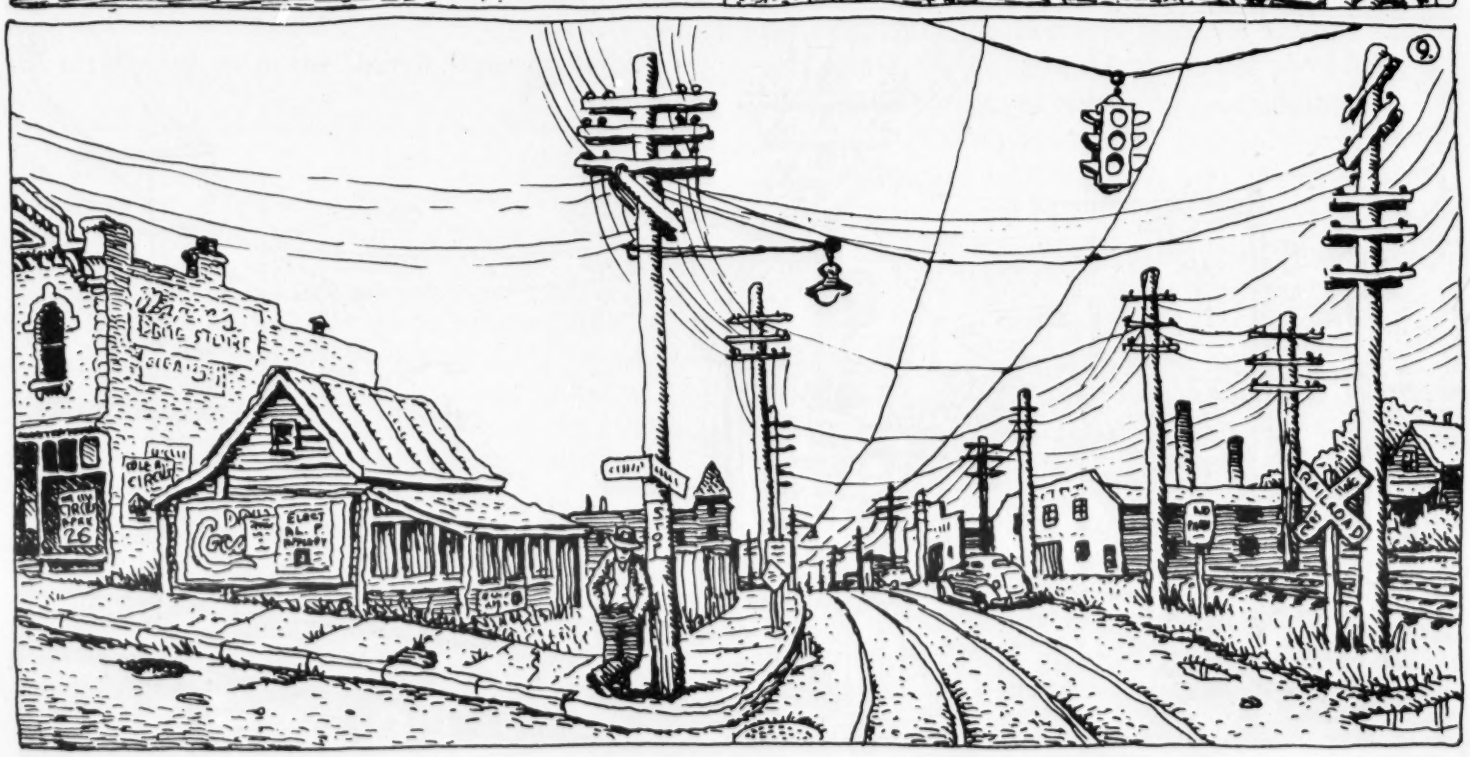
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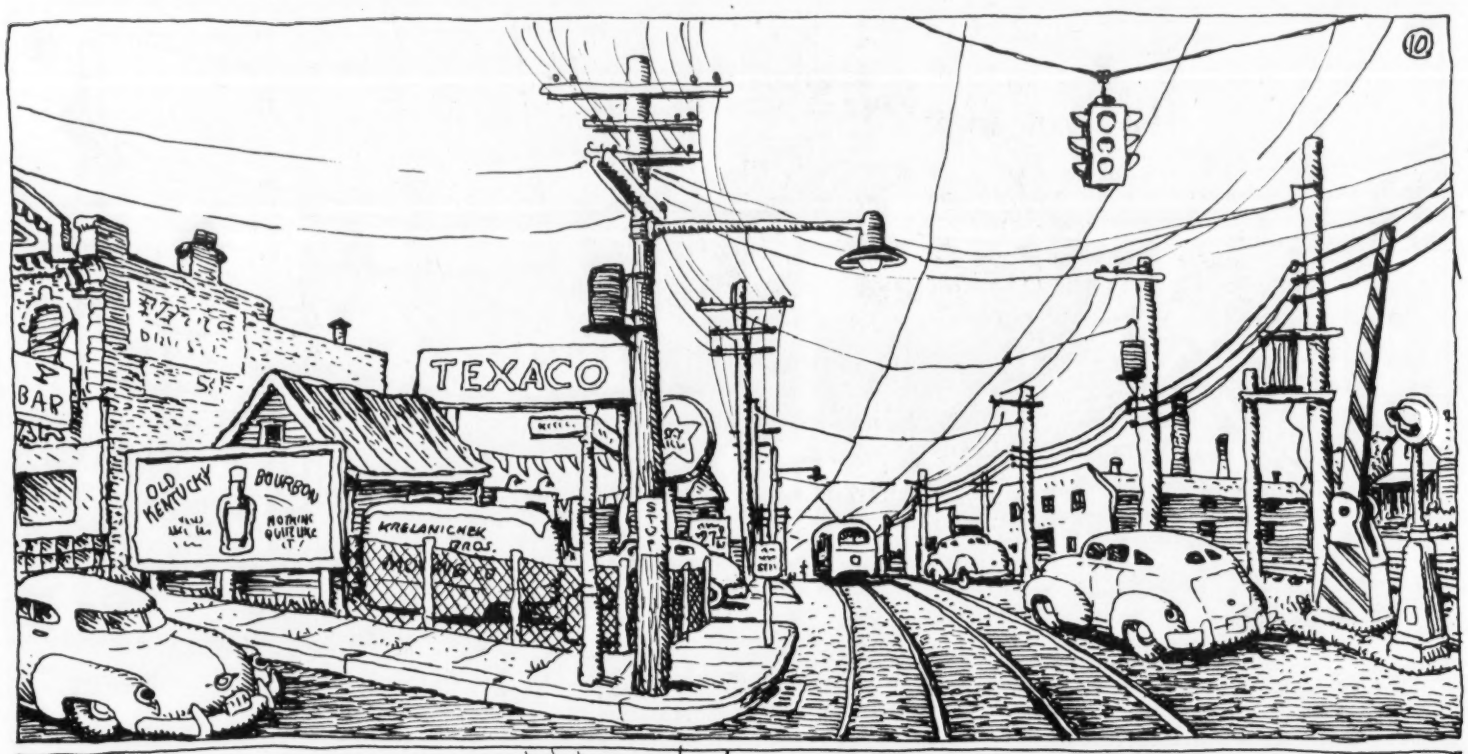
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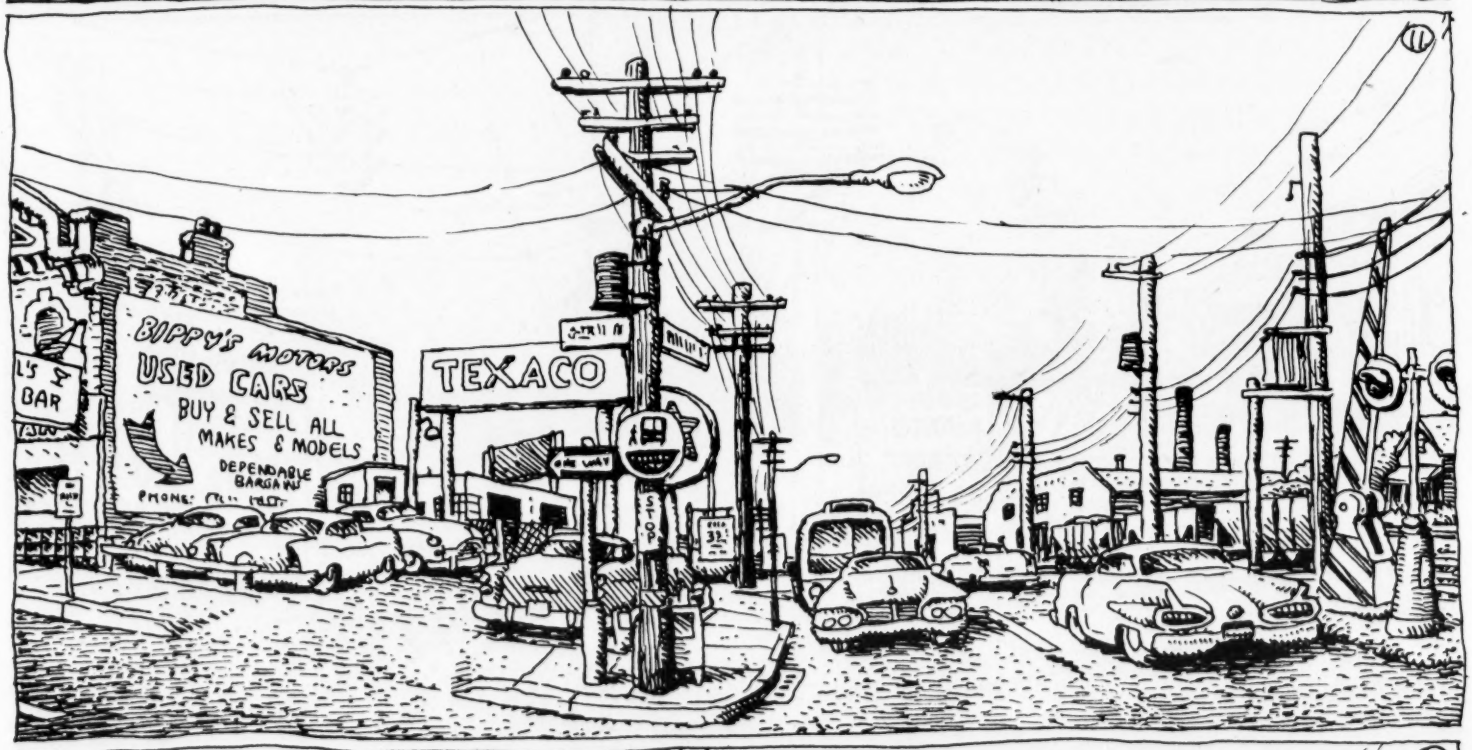
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MAKES & MODELS
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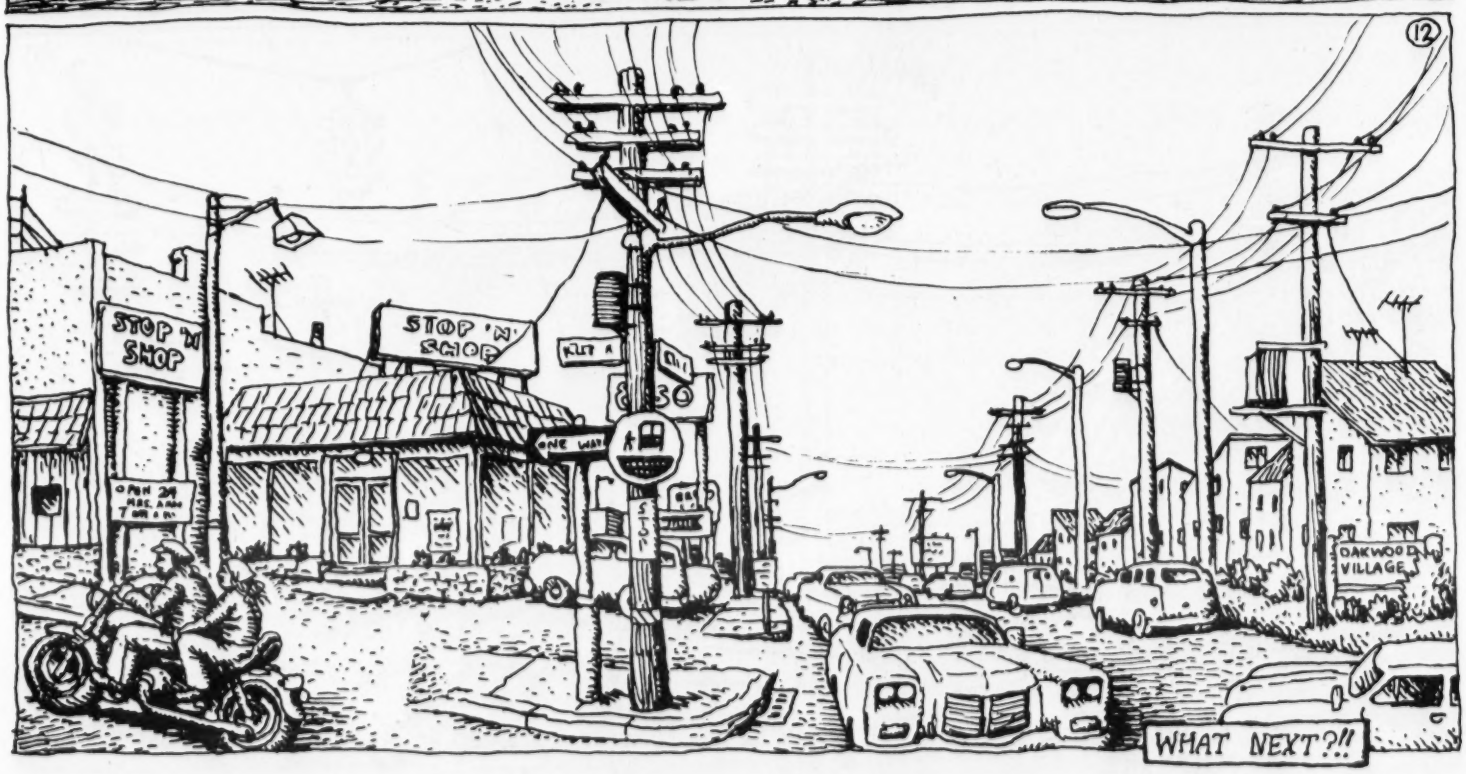
STOP
ONE WAY


12
STOP 'N' SHOP
STOP 'N' SHOP
ONE WAY
STOP
OAKWOOD VILLAGE
WHAT NEXT?!!

# OCEAN POWER: A SALT SOLUTION

*by Gerry Wick*

*The best source of energy from the sea may be – not waves or currents – but the saltiness of its water.*

The sea seems so boundless. It serves as a receptacle for our waste. It supports huge freighters that transport fuel, food, and other necessities of human life. It provides large quantities of protein and serves the recreational needs of millions of people. In our moment of crisis it is now being looked to as a solution to our energy shortage.

Of course the sea is not boundless. Although the open sea is not polluted, bays, bights and other enclosed or semi-enclosed sections of the sea show the effects of excessive dumping or discharging of wastes and toxic substances. Oil tankers have grounded or collided and broken up at sea, but their effects have not been irreversible. The fish supply of the oceans, although large, is not without limit; various species have disappeared due to mismanagement of the fishery. Competition with other uses has degraded the recreational potential of vast stretches of the coastlines. What about energy?

By now everyone in the United States should be aware of the energy problem. The proposed solutions to the energy crisis range from conservation of energy resources to rapid development of nuclear power plants. Proponents of controlled growth compatible with the environment are pushing for renewable energy resources, such as direct conversion of solar energy and wind power. Most of this effort has been directed toward the land even though a greater proportion of the sun's energy falls on the oceans, which cover 70 percent of the globe's surface. Despite its all-pervasive nature, the density of energy in sunlight is rather low, requiring large surface areas to collect commercial amounts of power. However, there are processes in the oceans that concentrate the energy so that it is not so difficult to extract.

The most obvious sources of ocean energy are the waves and tides. Coastal dwellers have used the ocean's mechanical energy for at least ten centuries, as evidenced by the relic tidal mills used to grind grain during Europe's Middle Ages. Today there are commercial tidal power plants in France, Russia, and China. Although tidal plants can provide significant quantities of energy to communities adjacent to embayments with large tidal excursions, the potential of tidal energy is limited. Even if all of the prime locations for tidal plants were developed, tidal energy could provide less than three percent of the present global power usage.

The power of ocean waves is legendary. In Wick, Scotland, a cement block weighing 1,350 tons was torn from a breakwater and rolled away during a storm. The replacement weighing 2,600 tons was carried away by the raging sea five years later. Most of our effort has been to contain the destructive force of waves through breakwaters and other devices rather than to utilize their energy. Yet the power expended by a 10-foot sea in raising and lowering a ship represents more power than that contained in the thrust of her propellers. Waves

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*Dr. Gerry Shishin Wick earned his Ph.D. in physics from the University of California, Berkeley, in 1967. He spent the next five years in England doing nuclear physics research, lecturing at the University of London, and writing popular accounts of science. From 1972 to 1979 he did research and taught at the Scripps Institution of Oceanography, University of California, San Diego.*

*His research interests and publications have spanned a wide range of subjects, including nuclear physics, elementary particles, marine energy sources, deep scattering layers, tornadoes, and particle-turbulence interactions.*

*In 1978, he became a Zen Buddhist monk with Maezumi Roshi at the Zen Center of Los Angeles. He is now director of the Institute for Transcultural Studies (ITS), an educational institute. One of the aims of ITS is to explore the connection between ancient spiritual wisdom and modern scientific knowledge.*

*–Eds.*

# OTEC

## Ocean Thermal Energy Conversion

*It was clear from the outset that much of this oceans issue of* CQ *was going to be involved with energy matters on, in, and from the sea. But as readers of the magazine, we wanted to preserve the tradition of covering areas of the waterfront not ordinarily frequented by other press and so waves, tides, and winds were set aside for salinity gradient energy, which is not nearly so well known, but which in fact has a better theoretical prognosis, given the usual required breakthroughs in hardware. Thus went the editorial decision. But you pays your piper, for soon a most interesting and earnest correspondence began to come in from Bryn Beorse and his younger colleague (Bryn is 83) Kevin Boru, who have been jumping through extraordinary hoops for years trying to get government initiative and capital together to produce energy from ocean thermal gradients. So we're excerpting it here, with thanks to Beorse and Boru. —Eds.*

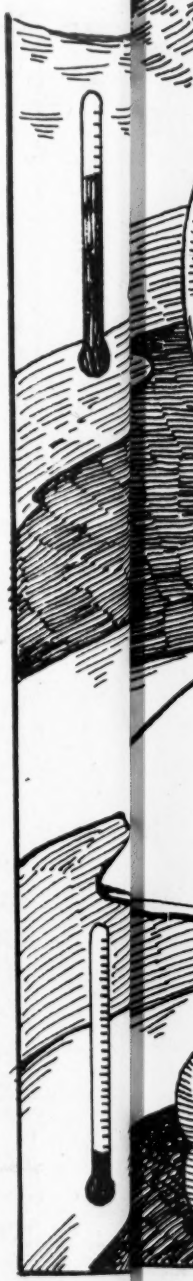
Dear Eds:

. . . Years ago the falacy was clear and open — except that those who had worked so hard and now actually saw a thing that worked, mechanically at least — were conned into lying, cheating and roaring to utilize their monsters. Three bold engineers of General Electric quit in protest — this should have aroused the nation — later 2,600 of our 10,000 nuclear technicians demanded a "moratorium" on all nuclear plants until research had been "completed." Even this did not rouse the nation. What does it take? A football hero? Or an earthquake? Or ten more Three Mile Islands? The latter apart, the waste products alone should have made us stop.

Of the ten ready technologies Wind, OTEC and Space satellites are ready now. OTEC and Space plants alone could produce all the energy we could ever use. OTEC alone could be built in five years. In fifteen we would have enough of these plants to stop all oil import. U.S. OIL would still be used — no reason for the oil companies to panic about the "competition." Although this is as far as most of them can see, or not see. Biomass, from land and sea, photovoltaic, tidal power, waves are also ready and some of these much cheaper than either oil, coal or nuclear. To produce 1,000 BTU of energy or heat, you need to spend over 3,000 BTU for either coal or oil energy, but only from 125 (says Lockheed) to 500 (says Richard Arlen Meyer of OTEC Liaison) to produce your 1,000 BTU. OTEC can be built for half the cost of nukes — plus free fuel (the ocean) while nuke fuel rises all the time — say New Orleans Shipyards. "Competitive" says OTEC builder TRW. (My colleague here, Dr. Cal Herrmann, is deep into salinity research along with being an enthusiastic OTEC man.)

I trust you see — and will express — the dark side of this scenario: the Government is geared for research — not implementation — by nature as well as by co-interest with narrow corporate views — that may kill us all in 20 years or so. Are we crazy? Yes, and dancers around the Golden Calf — dancing so crazily that we don't even build the half-as-costly OTEC-Space-Wind-Biomass plants in half the time it takes to erect nuke monsters. Can you get these facts into the heads of your readers?

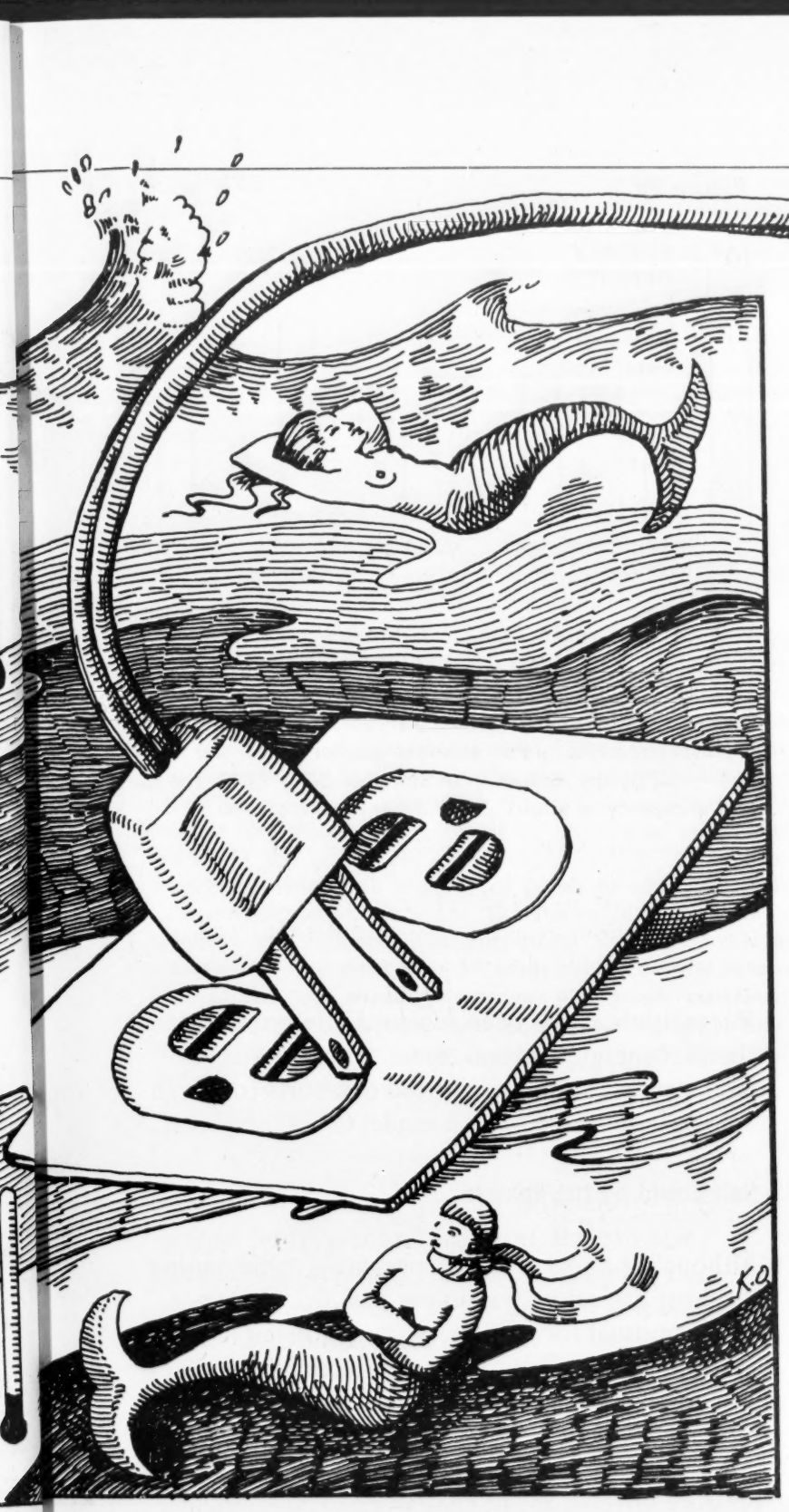
Thank you,
Bryne Beorse



over 100 feet high were reliably reported in 1933 by the skipper of U S S *Ramapo*. It has been estimated that the large waves that pound the northwest coast of the British Isles contain enough energy to provide all of the British electrical requirements. The British government was sufficiently convinced that it has allocated over ten million dollars for ocean wave energy research.

Wave energy conversion is an inventor's paradise, but not an investor's. Over 100 patents relating to wave energy conversion are on file in Great Britain alone. In this country the patents span a period over a hundred years and cover a wide range of feasibility including flaps, floats, ramps, converging channels, and liquid pistons. The only wave-activated device in common use was invented by Y. Masuda in Japan. The U.S. Coast Guard is currently using some of the Masuda buoys to power warning signals in harbors and in other waterways. Although they produce less than ten watts of power, larger-scale models are being planned.

As with other ocean energy sources, waves can make a large impact in certain limited locations, where the waves are consistently high, but their total impact is limited.



ILLUSTRATIONS BY KATHLEEN O'NEILL

(From the brochure, "Are You Looking at the World Through the Glasses of Abundance or Scarcity?" By Bryn Beorse and Kevin Boru, Alternative Directions in Energy and Economics, New College of California, 777 Valencia Street, San Francisco, CA 94110.)

Ocean Thermal Energy Conversion: OTEC uses the temperature differential in the ocean to provide power and energy. OTEC has been compared power-wise to a hurricane, but contrary to the hurricane, OTEC is constant day and night, summer and winter. OTEC plants produce electricity, hydrogen and ammonia and fresh water! There are three different types of OTEC systems:

*OPEN CYCLE:* Here the surface water is sucked into an evaporator in a state of vacuum sufficient to make the water evaporate at the temperature it has. This steam drives a turbine and is condensed by cold water pumped from below.

*CLOSED CYCLE:* Here the warm surface water heats a 'working fluid' (ammonia or a refrigerant) so it evaporates, drives a turbine and is condensed by cold water pumped from below.

*FOAM CYCLE:* Here a column of foam lifts water which drives a water wheel.

The Open and Closed Cycles are ready to be built now! The Foam is still being researched. OTEC guarantees a renewable source of sea-energy forever, and the fuel – *THE OCEAN* – is free! The estimated costs for OTEC range from $500 per kilowatt built to $1800 depending upon size and materials used (nuclear plants cost approx. $1500 per kw). Prices would be reduced as more plants are built. OTEC research began in 1881 in France, was brought to the U.S. in 1948. Now thousands of scientists, many universities and companies are awaiting funding, and are ready now to build OTEC systems.

One other mechanical source of ocean energy being investigated is the power in the motion of ocean currents. The currents off the eastern coasts of continents, such as the Gulf Stream off the USA and the Kuroshio off Japan, are by far the strongest currents in the world's oceans. There are plans to develop a huge turbine assembly to tap the Gulf Stream off the coast of Florida, but to date, no useful energy has been extracted. The potential for ocean current energy is less than that from all other ocean energy sources. Nonetheless, if it can be extracted, it can have a large effect on the energy situation in Florida.

The largest reservoirs of energy in the ocean are not these obvious mechanical forms of energy – waves, tides, and currents. As in many human endeavors, it is often the hidden truths that are most rewarding. In the case of ocean energy it is the hidden sources that are potentially most rewarding. Most of the energy in the oceans is contained in its heat and in its salt. The energy is bound up in thermal and chemical forms.

The form of ocean energy that the United States government is pursuing with greatest vigor is ocean thermal energy conversion (OTEC). Any two heat reservoirs at different temperatures, such as warm

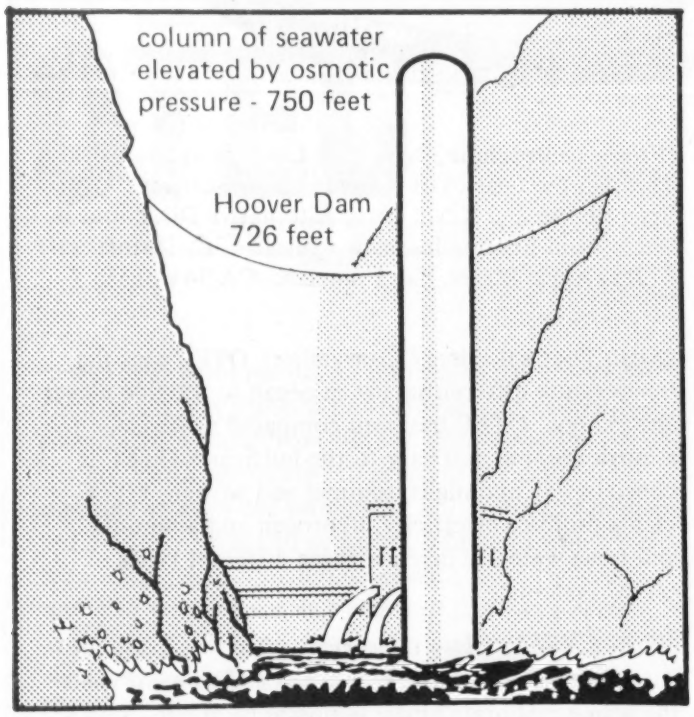
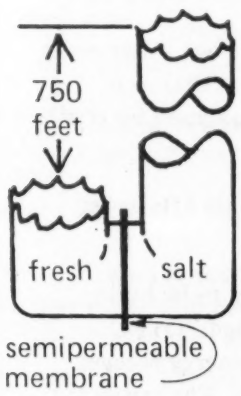


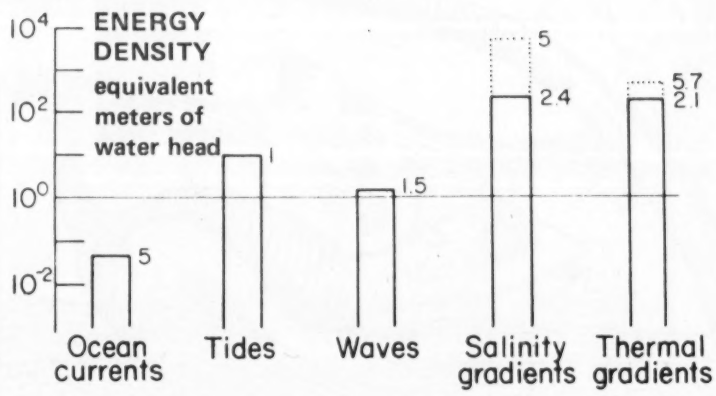

Figure 1.




**Osmosis between salt water and fresh water has the potential to generate power. Osmosis is the tendency of solutions on both sides of a semipermeable membrane to equalize their concentrations. The membrane prevents the salt water from diffusing into the fresh so the fresh water must dilute the salt. The volume of fresh water passing through the membrane is sufficient to raise the level of the salt water 750 feet. Techniques for tapping this hydraulic potential are described in this article.**

surface water and cold deep ocean water, can be used to drive a heat engine. Large temperature differences are necessary for efficient heat engines. Ocean thermal gradients between the surface and about 1,000 feet in depth are on the order of 10° to 20° Celsius, much smaller than the temperature differences of thousands of degrees experienced in power plants. Nonetheless, a Frenchman, George Claude, actually built an OTEC plant in Cuba in the 1930s. He succeeded in demonstrating his concept, but unfortunately, the ocean cannot be scaled down. Thus the pipe that Claude used to bring the cold water up from a depth of several hundred feet had to be full scale in order to avoid heat losses through the sides of the pipe. Consequently, the energy needed to pump up the water was greater than the energy generated by the scale model. Although Claude mathematically demonstrated that a full-scale model would generate net energy, his financial backers were not convinced. Shortly afterwards the cold-water pipe was destroyed by a hurricane, and Claude set out to study a floating power plant using his own money. Finally, when the buoy and pipe sank, he gave up.

Figure 2a.




**Concentration of energy in different ocean sources expressed as meters of head. The ocean-current bar is velocity head. Salinity-gradients head is for fresh water/seawater, the dotted extension represents the head for fresh water/brine. For thermal gradients the bar is for ΔT = 12°C, the dotted extension for ΔT = 20°C, the Carnot efficiency of about ΔT/300 has been included.**

Recently there has been renewed interest in ocean thermal energy. Several research groups and large corporations are involved in efforts to design components and deploy a model OTEC platform.

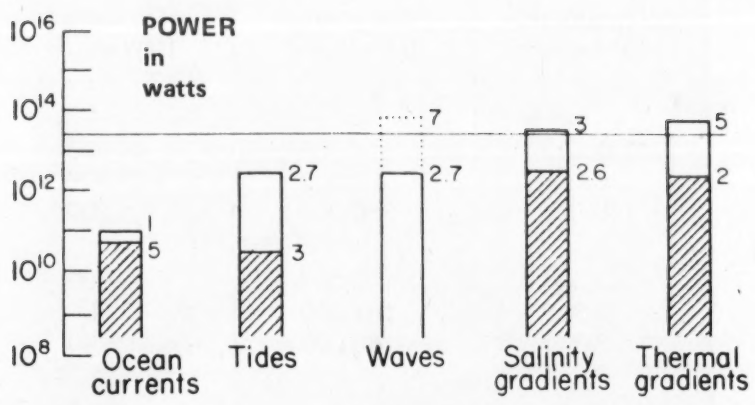
## Salt could be the answer

Although thermal energy is presently commanding the most attention, within the past few years a rather unusual form of energy has received notice. Where rivers flow into the ocean a completely untapped source of energy exists. A large osmotic pressure difference exists between fresh water and saline sea water. If entrees into this osmotic pressure difference can be developed, large quantities of energy will be available.

To demonstrate how to extract, in principle, the energy in salinity gradients, consider the following example (Figure 1). If a solution of fresh water and a solution of salt water are separated by a semipermeable membrane (a membrane that allows only water to pass but not salt), the water would flow through the membrane from the freshwater to the saltwater side. This phenomenon was discovered in ancient times, when wine was stored in sheeps' and pigs' bladders and cooled in vats of water. The bladder, being a semipermeable membrane, allowed the water to pass into it and dilute the wine. Sometimes the bladders swelled until they burst.

In our example, the fresh water would pass through the membrane and elevate the salt water until the pressure due to the height of the saltwater is

Figure 2b.




**Power or energy flux for various sources of ocean energy. The line at 15 TW ($10^{12}$ watts) is a projected global electricity consumption for the year 2000. The dotted extension of the wave-power bar indicates that wind waves are regenerated as they are cropped. The salinity-gradient bar includes all gradients in the ocean, but the concentrated gradients at river mouths, which will probably mainly be utilized, are indicated by the shaded area. Not shown is the power for subterranean salt or for river or seawater flowing into hypersaline ponds or salt flats which undoubtedly would be large. The shading on the thermal-gradient bar indicates that portion of the power that is theoretically extractable in a Carnot cycle. On the ocean-current bar, the shading represents the power contained in concentrated currents such as the Gulf Stream. Estimated feasible tidal power is shaded.** *(From Wick and Schmitt, 1977)*

**Table 1. Potential power due to salinity gradients**

| Source | Flow Rate ($m^3/s$) | Osmotic Pressure Difference (atm) | Power (watts) |
|---|---|---|---|
| Global runoff | $1.1 \times 10^6$ | 24 | $2.6 \times 10^{12}$ |
| Amazon River Brazil | $2 \times 10^5$ | 24 | $4.7 \times 10^{11}$ |
| La Plata-Parana River Argentina | $8 \times 10^4$ | 24 | $1.9 \times 10^{11}$ |
| Congo River Congo/Angola | $5.7 \times 10^4$ | 24 | $1.3 \times 10^{11}$ |
| Yangtze River China | $2.2 \times 10^4$ | 24 | $5.2 \times 10^{10}$ |
| Ganges River Bangladesh | $2 \times 10^4$ | 24 | $4.7 \times 10^{10}$ |
| Mississippi River U.S.A. | $1.8 \times 10^4$ | 24 | $4.2 \times 10^{10}$ |
| Salt Lake U.S.A. | 125 | 500 | $5.6 \times 10^9$ |
| Dead Sea | 38 | 500 | $1.8 \times 10^9$ |

equal to the osmotic pressure difference. In the case of freshwater and seawater, the osmotic pressure difference is equivalent to 24 atmospheres or the pressure at the bottom of a column of water 750 feet high.

One way of looking at it is that a 750-foot waterfall exists at the mouth of every river and stream in the world. Few dams are this high. At present the river water irreversibly mixes with the ocean water with no social gain. However, as an example, if half of the flow of the Columbia River were converted into electricity at only 30-percent efficiency, 2,300 megawatts would be produced. This is the size of two gigantic power plants.

Where the Jordan River empties into the Dead Sea, the energy density is even more spectacular. The nearly saturated brines of the Dead Sea have an osmotic pressure of about 500 atmospheres, corresponding to a dam over 15,000 feet high! Every cubic foot of water flowing into the Dead Sea per second could theoretically generate over one megawatt of power.

Table 1 shows the potential energy available from runoff of major rivers in the world and from other sources, including drainage into some hypersaline lakes. A value for global runoff is also given. This number represents the total renewable resource of salinity-gradient energy due to evaporation from the oceans, precipitation on land, and runoff back into the ocean. As I will mention below, there are even larger sources of salinity-gradient energy, but they are nonrenewable. Nonetheless, the renewable salinity-gradient energy can make a dent in our energy budget.

Figure 2 compares the renewable energy available from five ocean energy sources – ocean currents, tides, waves, salinity gradients, and thermal gradients. It also shows the energy density of each source: that is, the energy that can be extracted from a fixed quantity of water, such as one pound. Salinity-gradient energy has the highest density, especially for brine, and ranks with thermal gradients as having the greatest power available. If all of the salinity-gradient power from rivers were converted, it would supply about 10 percent of the present global power demands.

This figure of 10 percent makes sense in another way. It is a coincidence that the theoretical potential of hydroelectric energy from dams is approximately equal to the salinity power theoretically available from the global runoff of fresh water into the oceans. An alternative way of stating this fact is that the average height of the source of the world's rivers is 750 feet (240 meters), which is equal to the osmotic pressure height. So,

Comparison of the energy available from the salt and the oil in selected salt domes

| Domes | Salt volume (cubic miles) | Oil production ($10^3$ barrels) | Salt energy (MW-years) | Oil energy (MW-years) |
|---|---|---|---|---|
| | High yield | | | |
| Thompson (Ft. Bend, Texas) | 0.4 | 259,623 | 14,000 | 44,000 |
| Hull (Liberty, Texas) | 2.6 | 156,830 | 93,000 | 27,000 |
| Humble (Harris, Texas) | 9.8 | 138,639 | 350,000 | 24,000 |
| | Medium yield | | | |
| Avery Island (Iberia, La.) | 4.0 | 43,054 | 140,000 | 9,000 |
| Bayou Blue (Iberville, La.) | 4.6 | 20,806 | 161,000 | 3,500 |
| Belle Isle (St. Mary, La.) | 1.9 | 10,316 | 68,000 | 1,700 |
| | Low yield | | | |
| Lake Hermitage (Plaquemines, La.) | 0.9 | 2,475 | 32,000 | 420 |
| Bethel (Anderson, Texas) | 8.0 | 1,017 | 280,000 | 172 |
| East Tyler (Smith, Texas) | 4.3 | 55 | 150,000 | 9 |

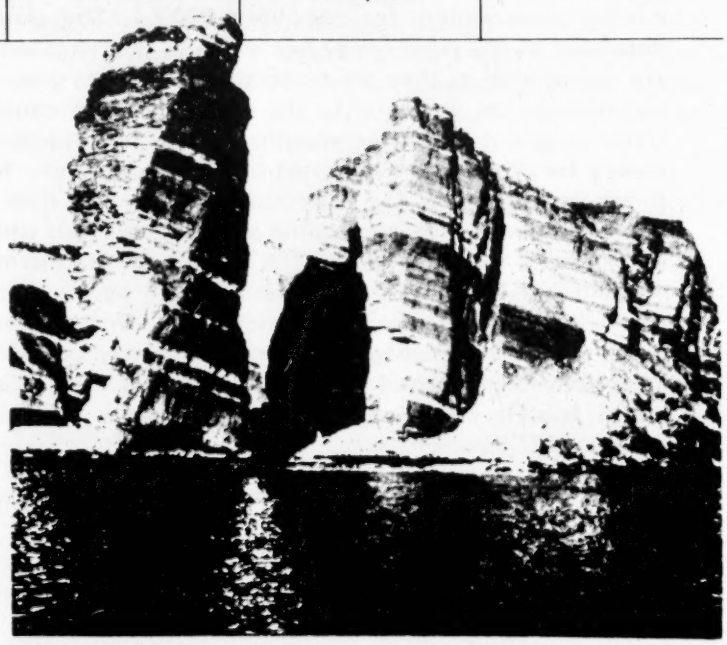
**Table 2: Salt Domes** (From Wick and Isaacs, 1978)

presumably, there is a possibility of extracting from river and stream flow at least as much energy through salinity-gradients as is extracted using hydroelectric dams. Hydroelectric energy provides slightly more than 10 percent (there's that number again) of the electrical power utilized in the United States at the present time. There is little chance that this percentage will increase. Therefore, we cannot expect salinity-gradient power from rivers to provide a much greater percentage of the United States' total. Nonetheless, it is not a trivial amount.

There is another source of salinity-gradient energy that may be an even more significant source than river runoff. Salt domes, subterranean formations of brine or solid salt, located adjacent to or under the sea, contain a surprising amount of energy. The brine or salt dissolved from the domes could be pumped to the surface and interfaced with the seawater (or nearby ground water similarly pumped). Salt domes are of interest because they are likely sites for oil and natural gas deposits.

Numerous salt domes have been monitored and drilled, particularly along the coastal zone of the Gulf of Mexico. These domes have yielded some of the largest oil strikes in the United States. Thus, it is surprising that we may be able to convert greater amounts of energy from the salt in salt domes than from the oil and gas found in them.

To get a sense of the energy contained in salt domes, let us consider one of the several hundred salt domes in the northern Gulf of Mexico. A typical one would be about 1,600 meters (one mile) in diameter and 1,600 meters (one mile) thick. If the salt is dissolved to make brine and the energy is converted at 100 percent efficiency, there would be sufficient power to run a large power plant (1,000 megawatts) for 30 years. Considering inefficiencies, the plant may be sufficient for five years.



**Exposed salt dome, Helgoland, Germany (from *The Sea* by Robert Miller, Random House.)**

An extremely productive salt dome can yield 100 million barrels of oil, although the vast majority yield much less. According to the Department of Energy, the domestic demand in the United States for all petroleum products is about 17 million barrels per day. Thus a huge field would run dry in a week if fully utilized. In comparison with the salt energy, the oil energy in our high-yield dome could power a 1,000-megawatt power plant for only 17 years – half of the salt value. Thus, even for a highly productive well, the salt is more energetic in theory than oil. This fact is clearly demonstrated in Table 2, which gives some actual examples. I have listed typical wells in three categories: high yield, medium yield, and low yield. There are many more wells in the low-yield category.

Furthermore, there are more "dry holes" than "strikes" in the hundreds of salt domes that have been drilled. The majority contain no oil. Thus, the salt in salt domes is a large untapped energy resource, even if it can only be converted at five percent efficiency. As I will mention later, some of my research indicates that 50 percent efficiency is not an unreasonable estimate.

**Production of salt by evaporation on Bulgarian Black Sea coast (from *The Sea.*)**

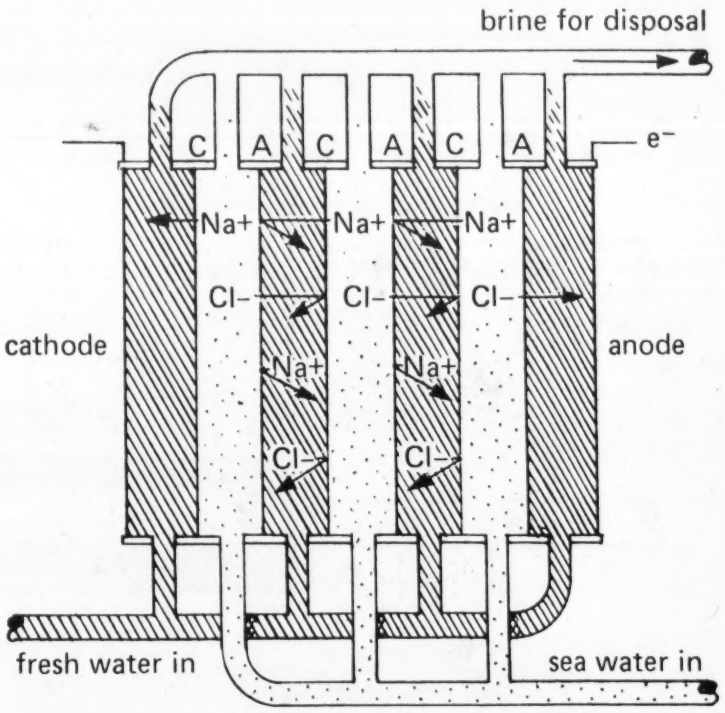



**Figure 3. Dialytic battery. Only a few cells are shown here, but many more would be included.**

Another likely source of salinity-gradient energy is the dried lagoons or salt pans along arid and semi-arid coasts. By controlling influx of seawater into these lagoons, a concentrated brine can be maintained through solar evaporation. Then this brine can be interfaced with sea water, which would serve as the dilute solution.

Salinity-gradient energy is a form of solar energy and is continuously renewed in the case of rivers flowing into the ocean, or of inundated salt pans whose brine concentration is controlled by solar evaporation. The salt domes are examples of stored solar energy. They were formed in the seas. Thus they are nonrenewable on a short geological time scale. As for the case with oil and gas, once the salt in such domes is mined and utilized, it is gone for eons.

The extent of subterranean salt and its useable energy content is unclear. In the United States, there are immense salt deposits in the Mississippi Valley and under the Great Plains, as well as in other places. Figure 2 only gives the power available from river runoff. The power from salt deposits and from salt pans is undoubtedly much larger, which means that salt could possibly make large inroads into the energy scene.

Now, the question arises, how do we convert salt into energy?

## SALINITY-GRADIENT ENERGY CONVERSION

Energy is required to separate salt from water. Thus, we might expect that the mixing of salt and water would release energy. Numerous schemes have been developed to desalinate salt water. If they are operated in reverse, many of these schemes will yield energy. Here I will only mention those methods that have a hope of commercial success.

### 1. Reverse Electrodialysis or the Dialytic Battery

When two solutions of different salt concentration are separated by a "charged membrane," an electrical voltage will be created between them. In the case of fresh water and seawater, this voltage is about 80 millivolts, or 0.08 volts across one membrane. It is possible to stack 1,000 such cells in series and generate 80 volts.

For a "reverse electrodialysis" stack, two types of membranes are used, called anion-permeable membranes and cation-permeable membranes. The cation-permeable membranes will allow the positive ions (in this case, mainly sodium ions, $Na^+$) to pass through, and the anion-permeable membranes will allow the negative ions (mainly chloride ions, $Cl^-$) to pass through. If one alternately stacks anion-permeable (A) and cation-permeable (C) membranes and fills the alternate cells with fresh water and salt water, respectively, the voltage will add up as already mentioned (see Figure 3).

Electrodes would be needed at the ends of the stack only. An anode of platinum-plated titanium and a cathode of steel will waste two to three volts under operating conditions. With 1,000 membranes, the inefficiency due to the electrodes is almost negligible.

In conventional electrodialysis, a voltage is applied across a stack similar to the one shown in Figure 3. In this mode of operation, all of the cells would be filled with brackish water and the end product would be fresh water and salt water in alternate cells. Electrodialysis is used for many commercial processes, such as sweetening orange juice by removing some of the citric acid.

Some initial studies indicated that it would cost

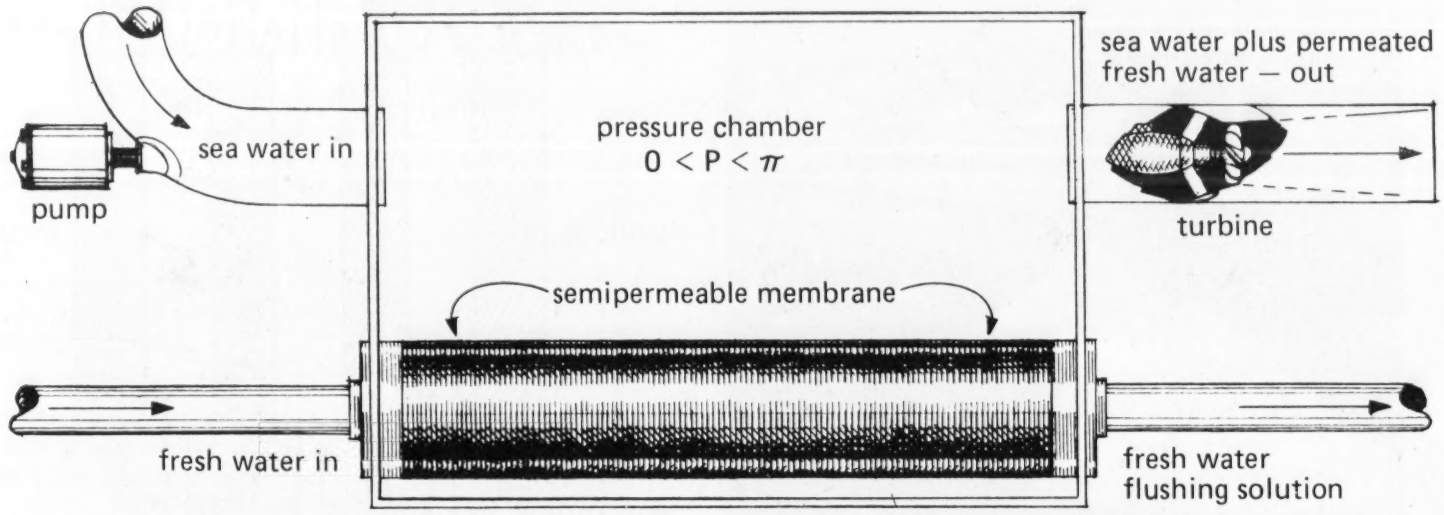



**Figure 4. Pressure-retarded osmosis turbine. The seawater is pumped to a pressure, $P$, which is less than the osmotic pressure difference, $\pi$.** *(From Wick, 1978).*

about $50,000 per kilowatt to build a reverse-electrodialysis power plant. This figure is about 50 to 100 times greater than the capital cost of a conventional power plant. With thinner mass-produced membranes, it may be possible to reduce the capital cost to about $600 per kilowatt, which is more competitive with other sources. Operating costs of about two to four cents per kilowatt-hour were estimated for reverse electrodialysis. This compares favorably with two to four cents per kilowatt-hour for power delivered to the local meter.

Research groups in the United States and in Sweden are further exploring "reverse electrodialysis." The biggest problem is the membranes. They are costly, subject to degradation, and require pretreatment of the solutions. The next method is subject to the same defects.

## 2 Pressure-retarded Osmosis

In 1975, Israeli researchers invented a device that utilizes the osmotic pressure directly for power. Their scheme, which is easier to handle than the 750-foot column of water in our example above, is called "pressure-retarded osmosis." It uses pumps, pressure chambers, and turbines to achieve the same effect as the 750-foot column of water.

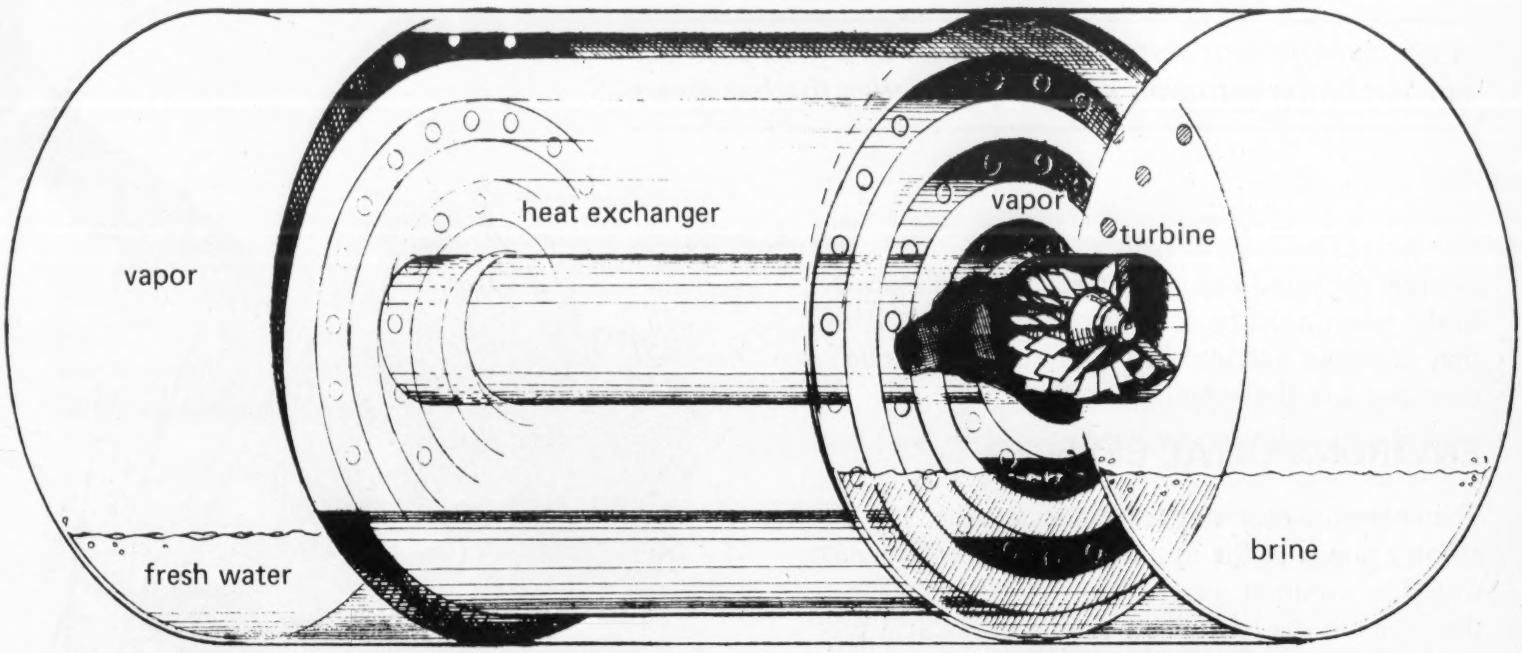
High salinity water is pumped to a hydraulic pressure equal to about half the osmotic pressure difference between the high-salinity water and the low-salinity water used in the device. The two fluids are separated by semipermeable membranes, which allow the fresher water to flow into the more saline water. In order to permeate into the salt water, the fresh water must flow against the pressure on the saltwater side of the membrane. Essentially, the osmotic pressure drives the fresh water into the pressurized salt water (as long as this imposed pressure is not greater than the osmotic pressure difference). The power is generated when this permeated fresh water is released through a turbine (Figure 4).

The latest research conducted on pressure-retarded osmosis in the United States gives some estimate of its economics. The calculations indicate that it would cost $10,000 per kilowatt to construct a plant and 30 to 40 cents per kilowatt to deliver the power to the user. Improvements in membranes can reduce the cost to 10 to 14 cents per kilowatt-hour, making it economically feasible. However, there are still some basic problems to overcome and more research to be done.

## 3 Reverse Vapor Compression

The two energy conversion schemes described above depend upon membranes, semipermeable for pressure-retarded osmosis and ion-selective for reverse electrodialysis. There are numerous technical difficulties with membranes in addition to the high cost, deterioration, and solution-pretreatment requirements, mentioned above. However, there is a promising method that requires no membranes.

Power can be extracted utilizing the vapor pressure difference between fresh (or low-salinity) and salt (or high-salinity) water. At the same temperature, water evaporates more readily from fresh water than it does from saltwater. Due to this lower vapor pressure on the saltwater side, water vapor will rapidly transfer from fresh water to salt water in an evacuated chamber. If a turbine is interposed




Drawings by Don Ryan

**Figure 5. Reverse vapor compression.** *Rotation of the cylinder causes all the copper surfaces to be wetted by their respective solutions. As most of the evaporation and condensation occurs on these surfaces, latent heat is efficiently transferred. The turbine is driven by vapor transferring from the fresh water side to the brine side. (From M. Olsson, G. Wick and J. Isaacs, "Salinity Gradient energy: Utilizing Vapor Pressure Differences,"* **Science**, *in press.)*

River entering the sea at Cape Siar, New Guinea. Photo Eric Read from **The Sea**, Miller, Random House, 1966.

between the two solutions, power can be extracted. The corresponding desalination method is called "vapor compression desalination." In "reverse vapor compression," the vapor would expand through the turbines. The surfaces of the water act as membranes, which would be needed otherwise.

Due to the low vapor density and low pressure differentials, large turbines would be required to extract power. Similar schemes have been proposed for ocean thermal energy conversion (OTEC). There is a comparable vapor pressure difference between cold, deep, ocean water and warm surface water. Modern designs incorporate 75-foot (24 meter) diameter turbine blades. The ocean current turbines are even larger.

When the vapor transfers between the two solutions, it carries energy in the form of the latent heat of vaporization. This is the heat that is released by the vapor to its surroundings when it condenses and is absorbed from its surroundings when it evaporates. More energy is transferred by the latent heat of vaporization than is present in the vapor motion. This heat transfer would tend to slow down the process and eventually stop it unless the heat were returned to the freshwater reservoir or the system were flushed before much of the energy had been extracted.

To overcome this problem, evaporation and condensation can take place on opposite sides of an efficient heat-exchanger plate, as it is in vapor compression desalination. Figure 5 shows a model we built at the University of California. It consisted of a spiral heat exchanger that doubled as a mixing pump when the unit was enclosed in a slowly rotating cylinder.

In tests, we obtained power densities of as much as 10 watts per square meter of heat-exchanger surface. This value is over 10 times higher than that for reverse electrodialysis. Furthermore, heat-exchanger surfaces, such as copper, are much cheaper and longer-lived than membranes. Since water pretreatment is not necessary and biological fouling and corrosion are not so important, "reverse vapor compression" appears to be the most cost-attractive. Very high efficiencies approaching 100 percent are possible for low vapor transfer rates.

As the vapor pressure difference increases dramatically with temperature, it would be advantageous to place a power unit near a low-grade source of heat, such as geothermal heat or waste heat from extant power plants. However, above 80°C, scale deposits may occur in some brines due to precipitation of gypsum. One other problem is to maintain a

*Any development schemes should be designed so that our vanishing estuaries are not put under further stress.*

vacuum for rapid vapor transfer. Gases dissolved in the water must be continually evacuated. This may not pose a serious problem but needs to be considered in the overall operation.

## ENVIRONMENTAL EFFECTS

The environmental impact of the development of salinity power at the mouths of rivers probably would be minimal, except for large structures in the ocean in the case of the crude mechanical system. Also, some form of aqueduct will be necessary to bring the two water bodies together in a relatively small space. In the mixing process the amount of heat that is generated is trivial, and mixing will raise the temperature less than half a degree Celsius, actually less than would result from natural mixing. Thus the by-products would be discharged much in the same way as they are under natural circumstances. It seems quite obvious that the deleterious environmental effects can be minimized.

It should be mentioned that estuaries are found at the mouths of many rivers and that many are among the most productive areas in the marine environment. Thus, any development schemes should be designed so that our vanishing estuaries are not put under further stress.

Some important problems that must be solved are the management of sediments carried by the rivers and the protection of marine life that might be sucked into inlet pipes from the ocean.

Corrosion, biological fouling, and silting may be very serious problems if these membranes are in seawater. Some type of filtration will be required on both the seawater and the river water. Perhaps even pretreatment of the water will be necessary to prevent fouling and corrosion and also to increase the efficiency of the membranes or to increase the voltage in some way. There is some pretreatment in electrodialysis in order to minimize the deleterious effects. In the example of hypersaline sinks, the lack of organisms will eliminate one of these problems. In schemes using vapor-pressure differences, fouling and corrosion are not so serious. Fouling may not even occur in the evacuated chambers required for these schemes.

The environmental effects from brines interfaced with seawater or fresh water depend upon the location. Along desert coasts, the end-product could

*Shorebirds feeding on the salt marsh. Illustrated by Richard G. Fish from* **Life and Death in the Salt Marsh** *by John and Mildred Teal, Ballantine, 1969.*

be safely discharged into the ocean, since it originated there. Brines derived from salt deposits, however, have somewhat different effects. They are not renewable and would represent an additional salt burden wherever they are discharged. In regions with continuous ocean currents, the resulting dilution of brine discharge would hardly be felt. However, other products, such as oil remnants, may have to be removed.

Injection or reinjection of waste products into the earth has been suggested. The geological structure needs to be examined to insure isolation of these products. Also, the expense may prohibit this form of disposal.

## PROSPECTS

Salt resources are abundant throughout the world, but to utilize the salt for energy, certain conditions must be met. The most important is the proximity of a large body of fresh water. This requirement is quite restrictive. Sunshine is required to renew the salt resource, and precipitation is required for the fresh water. These two conditions generally do not occur in the same region.

If membranes could be developed to use saline water as the "fresh water" and brine as the concentrated solution, many regions would be opened up for salinity-gradient energy. Reverse vapor com-

pression may be a more obvious approach. Significant portions of the United States have saline ground water. The salt domes on the Gulf of Mexico can also be used with seawater as the dilute solution. Similar situations exist in other countries.

Membranes suitable for use with brines may already exist. The Japanese have a problem of limited salt resources rather than limited freshwater resources. Thus in their electrodialysis units, they highly concentrate the brine and discharge the fresh water. The membranes have been developed to tolerate highly concentrated salt solution. It may be advantageous for salinity-gradient researchers to examine these membranes. Some preliminary work has been done at the University of California, but more remains to be done.

The one major method that does not require membranes, the utilization of vapor-pressure differences, does not have the same problem of membrane deterioration. This method may be most useful, at least initially, with brines. Some of the technology developed for Ocean Thermal Energy Conversion, such as large turbines and heat exchangers, may also be used for this method.

It is certainly possible to produce power from salinity-gradients. Cost is the most critical factor. We need an improvement of at least a factor of 100 in the cost of membranes before we can consider that membrane schemes, such as reverse electrodialysis, would be worth pursuing in general.

One point that needs considerable investigation is the thermodynamic efficiency of salinity-gradient power and its comparison with the economic efficiency. It seems quite likely that, by operating at a very low thermodynamical efficiency, we will be able to overcome some of the problems that require expensive components.

For example, we may not need to use the most efficient, most expensive membranes where we have an abundance of water and consequently of potential power. It has been pointed out that, in the employment of the nonrenewable-resource fossil fuel, early development capitalized on abundance and low efficiency. With salinity-gradient power, a renewable resource, such an approach might be more justifiable.

Also, we have to consider the scale of the project. Small conversion plants may serve our purposes better than large plants. The location of the plant would, of course, bear upon its size. In remote regions that do not have any other source of electricity, salinity power of streams or salt pans may provide it. Immediate applications may be found for salinity power from brine, where the power density is much larger than that for seawater.

The major thrust of the energy policy in this country is to enhance the well-worn paths – oil, coal, and nuclear energy. As is well known, these industries have numerous deleterious side effects, such as air and water pollution, disruption of the countryside, problems of long-term storage of radioactive waste products, and proliferation of nuclear weapons. It is not necessary to put all of our eggs in one or even two baskets. If an alternative energy source can provide even a few percent of our energy demands, then it is worth pursuing. It is improbable that ocean sources will single-handedly solve the massive energy appetites of the globe. Initially, ocean energy may make the best sense in select locations and in small-scale application. But as we gain experience, I would not be surprised if ocean sources make their mark by the turn of the century. ■

## RECOMMENDED READING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# SALT TOLERANT PLANTS

*by G. Fred Somers*

## Halophytes: a New Option for Expanding Food Production

*It is common knowledge that most food plants are the result of centuries of farmers or, at least, harvesters selecting and propagating the seeds or cuttings of those plants that most possessed whatever the beholder or eater most liked or required. Salinity, salt, entering the water or building up in the soils of farmland has been the ruin of countless acres and, generally, the salt-stressed shorelines of the world are not notoriously successful places for agriculture.*

*Salt-tolerant plants – halophytes – with any possible chance of contributing to the general food budget are being explored by the Halophyte Research Group at the University of California at San Diego, and by Dr. Fred Sommers at the University of Delaware. Dr. Emanuel Epstein and Jack Norlyn of the former group have concentrated on salt-adjusting food plant species. By request, Dr. Sommers sent us this note.*

*–Eds.*

*Drawing by Mary Brecken*

*Jaumia, pickleweed and spike grass. From* **Coastal Ecology, Bodega Head,** *U.C. Press, Berkeley, 1973.*

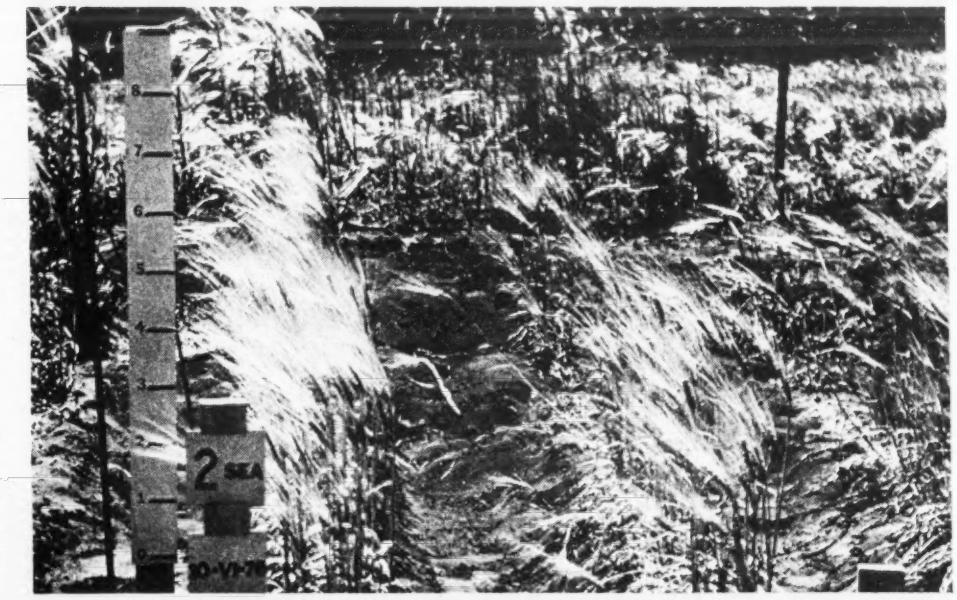
It has long been recognized that large areas of the world are of very limited use for food production because they lack sufficient fresh water. Rainfall is limited during the growing season. Available irrigation water is not sufficient to match the desired land-use potential. Years ago one could naively project a future with abundant sources of nuclear energy, which could be used to remove salts from the abundant oceans or other sources of saline water, and to deliver the resulting fresh water to newly developed arable land for crop production. But the present realities show clearly that this is not a viable option for expanding food production. Yet the pressures of an exploding population demand some solution.

There may be another option; one only now being examined, though its roots go back several years. Man has long been faced with an enigma. Many plants grow abundantly in very saline habitats, yet much lower salinities are lethal to conventional crop plants. The latter have been derived from species adapted to habitats supplied with fresh water and have been selected to succeed in such situations. But what about halophytes – plants that grow in saline habitats. They have adapted to this stressful situation. Can one find species among them that might have potential for food production for man or domesticated animals? In other words, instead of ameliorating the environment by desalinizing water and reclaiming saline soils, can we capture the potential of halophytes?

A cursory examination of plants in saline habitats soon forces some choices. Obviously not all such plants are equally suitable. But man is not without experience to guide him. Some tide marsh plants have been used as forages. Examples are salt meadow cordgrass (*S. partina*) and, to a more limited extent, smooth cordgrass (*Spartina alterniflora*). Other grasses with similar use are species of spike-grass (*Distichlis spicata* and *D. stricta*), dropseed (*Sporobolus virginicus*) and alkali sacaton (*Sporobolus airoides*). Some plants from saline areas have been used directly by man for food. One example is orach (*Atriplex patula*), useful as a leafy vegetable. Another is *Distichlis palmeri* used by the Cocopah Indians as a cereal. Some plants from these habitats are similar enough to conventional crops to be used as a source of germplasm to incorporate salt tolerance into them. But the choices appear to be very limited for this approach.

Some five years ago we started to select plants that appeared to have the desired quality: salt tolerance and potential as a food/feed crop. We have examined species from coastal tide marshes, especially of eastern U.S.A., but also of the northern shores of the Gulf of California. We have obtained seeds from many additional sources. Greatest attention has been given to species with some

# Seawater Barleycorn?




*Two rows of barley, a week before harvest, in a plot irrigated with undiluted seawater. "Seawater-Based Crop Production: A Feasibility Study," by Emanuel Epstein and J.D. Notlyn,* Science *197: 249-251.*

To find barley extremely tolerant of salinity – ultimately tolerant of seawater – the scientists obtained seed of a "composite cross" of barley. This seed, provided by the Department of Agronomy and Range Science, University of California, Davis, represented a large reservoir of genetic variability derived from 6,200 strains from all over the world. The seeds were planted in large tanks containing nutrient solution salinized with a synthetic seawater salt mix.

This treatment eliminated all but a small percentage of the plants and resulted in the selection of a few strains that not only survived but eventually flowered and set seed. The process was carried out in greenhouses on the Davis campus.

The success of this feasibility study suggests that currently unproductive, sandy coastal lands could be added to the world's crop growing areas, the scientists say. Such a system of crop production based on seawater would make the immense wealth of water and nutrients in the oceans available for the growing of food (and perhaps, fiber) crops.

The main role of the sandy soil would be a mechanical one rather than a combination of mechanical and chemical functions, as in conventional agriculture. Esssentially, the soil would serve as a permeable medium giving plants ready access to water and mineral nutrients, similar to hydroponics substrate.

Epstein and Norlyn do not think it likely that the barley strains selected for seawater culture would be suitable for irrigation agriculture in interior locations of the arid and semi-arid regions of the world that are being impaired by salinity, since the chemistry of such soils is very different from that of seawater. But they do believe that the principle of selecting suitable strains can be used to obtain varieties better able to grow on salt-affected soils.

Robert Powell, "California Scientist Develops Salt-Tolerant Barley," in *Sea Grant '70s,* Vol. 7, No. 2, October, 1976, Texas A&M Univ.

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previous history of use as a crop, though we haven't ignored related species that appeared particularly promising.

Smooth cordgrass in test plots proved to be highly productive, but the yield of dry matter was related to the source of the seeds and other factors. The average for plots from Maine seed was 1.5 tons/acre; from New York and Virginia seed was 3.5 tons/acre. Some yields were 5 tons per acre using water that was 25,000 to 30,000 ppm total dissolved salts for most of the growing season. We have reason to believe that these yields can be increased substantially with nitrogen fertilization. The disadvantage of cordgrass is that the mature forage is coarse and, following periods with little or no rain, the leaves have salt crystals on them. These result from secretion by glands in the leaves, but can be readily removed by rinsing. Periodic harvests during the season should yield more desirable forage. Yield from such a practice is now being determined. This plant grows best in waterlogged soils.

In contrast, saltmeadow cordgrass prefers soils that drain more readily. There is also much variation in this plant. Because it tolerates sprinkling with highly saline water, it might be suitable as a turf that could be irrigated, possibly, with seawater.

Two leafy vegetable crops appear to have considerable potential. Orach and lamb's quarter (*Chenopodium album*) both grow very well when supplied with water of about 25,000 to 30,000 ppm sea salts. Both are annuals, and best success is obtained by starting the plants very early in the spring to take advantage of spring rains and growing the crop in a soil that is not waterlogged. They both grow well on well-drained, sandy soils flooded regularly with very saline water.

Another species with exciting potential as a crop is seashore mallow, *Kosteletzkya virginica,* a perennial. The seeds in this case are about the size of wheat grains, and they contain about 33% protein and 30% of an oil that compares favorably with corn oil in being unsaturated. In addition the seeds contain a mucilage that may have technical uses. (The root of a related species, marshmallow [*Althea officinalis*], yielded the original nonsynthetic mucilaginous marshmallow-paste, according to Gray's *Manual of Botany*.) Moreover, the seeds of this plant do not shatter badly when ripe, a desirable attribute not shared by many wild plants.

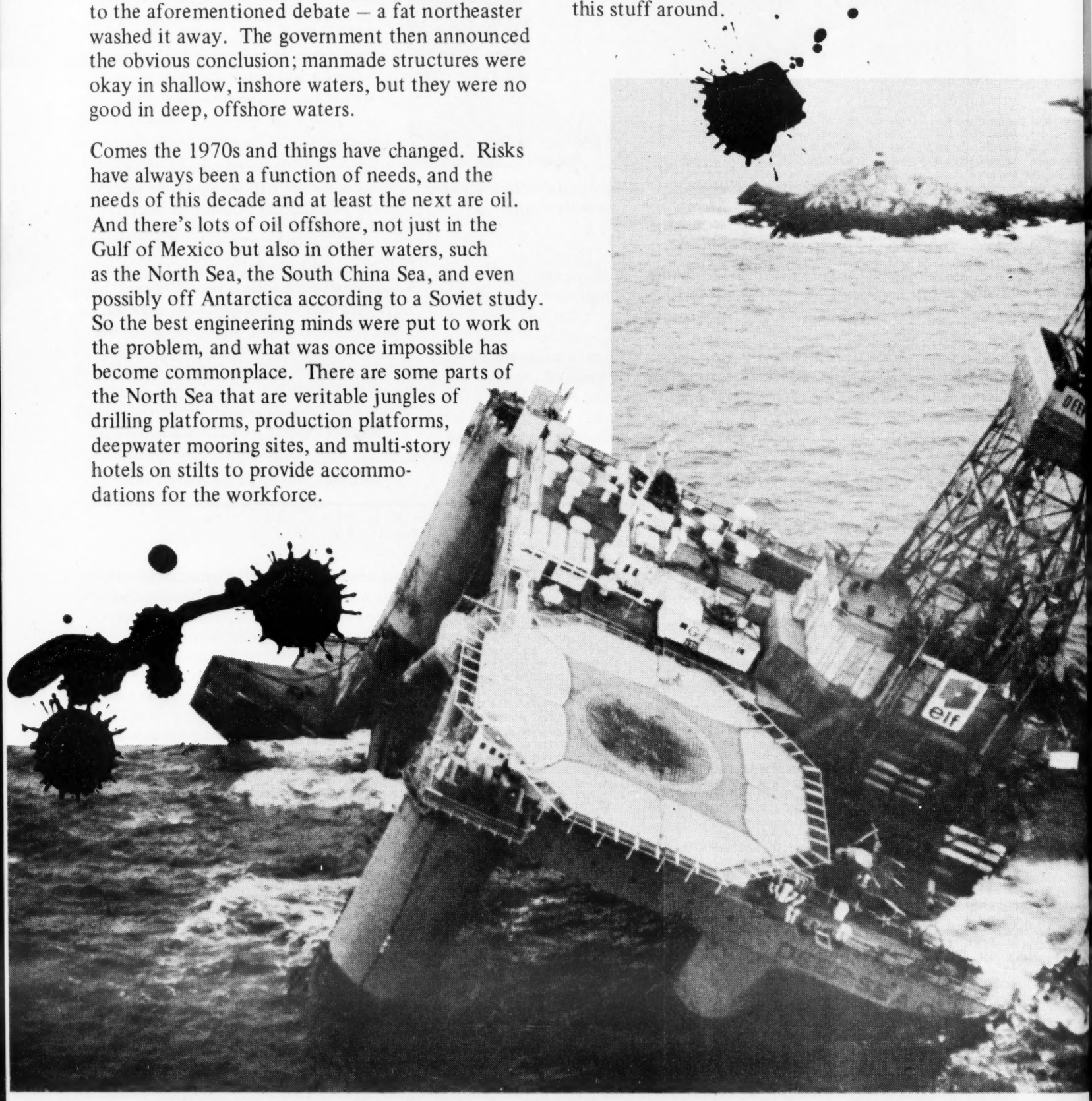
In short, there appears to be a very promising potential for developing useful new crops that can be grown using highly saline water. This could provide a new option for expanding food production on the millions of acres for which the only water available is too saline for conventional crops. ■

# "Large" Redefined

I remember a time two million light years back (the 1950s) when to build a manmade structure offshore was an awesome undertaking, not to be taken lightly. A debate raged – are these structures safe, will they hold in a serious sea, can they be positioned accurately, do the costs justify the benefits? I also remember the height of the Cold War, when the government built a platform about a hundred miles off the coast where I lived and covered it with (for then) sophisticated radar to detect incoming Russian bombers. That so-called Texas Tower lasted for a few years and put an end to the aforementioned debate – a fat northeaster washed it away. The government then announced the obvious conclusion; manmade structures were okay in shallow, inshore waters, but they were no good in deep, offshore waters.

Comes the 1970s and things have changed. Risks have always been a function of needs, and the needs of this decade and at least the next are oil. And there's lots of oil offshore, not just in the Gulf of Mexico but also in other waters, such as the North Sea, the South China Sea, and even possibly off Antarctica according to a Soviet study. So the best engineering minds were put to work on the problem, and what was once impossible has become commonplace. There are some parts of the North Sea that are veritable jungles of drilling platforms, production platforms, deepwater mooring sites, and multi-story hotels on stilts to provide accommodations for the workforce.

The scale of all this is staggering. The investment in the offshore oil and mineral industry, nearly all privately funded, is approaching the scale of some of this country's largest public undertakings, perhaps even the moon-shot program itself. Picture this – ships that can lay pipe continuously along the ocean floor, mooring systems that can secure supertankers in the open sea, drilling ships that are not fixed to the bottom, rather they are held automatically in place by satellite navigation systems, anchors that are as large as freight-train engines, 25,000-horsepower tugboats to haul all this stuff around.



Out of sight, out of mind, of course, unless you live in the Caribbean, where an offshore oil platform recently went haywire and started pumping oil into the ocean instead of into a ship or a pipeline; or you live in the Shetlands, where offshore oil investment has knocked the hell out of the island economy.

If you are a landperson, you can see a nuclear powerplant and, if you have a brain in your head, it scares you out of your wits. If you are a seaperson, you will sooner or later see an offshore oil platform; it, too, will scare you witless.

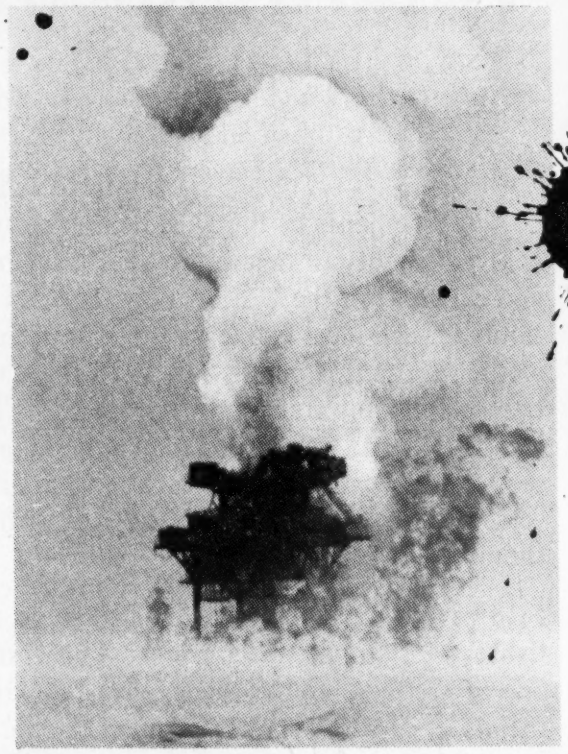
—P.H. Spectre

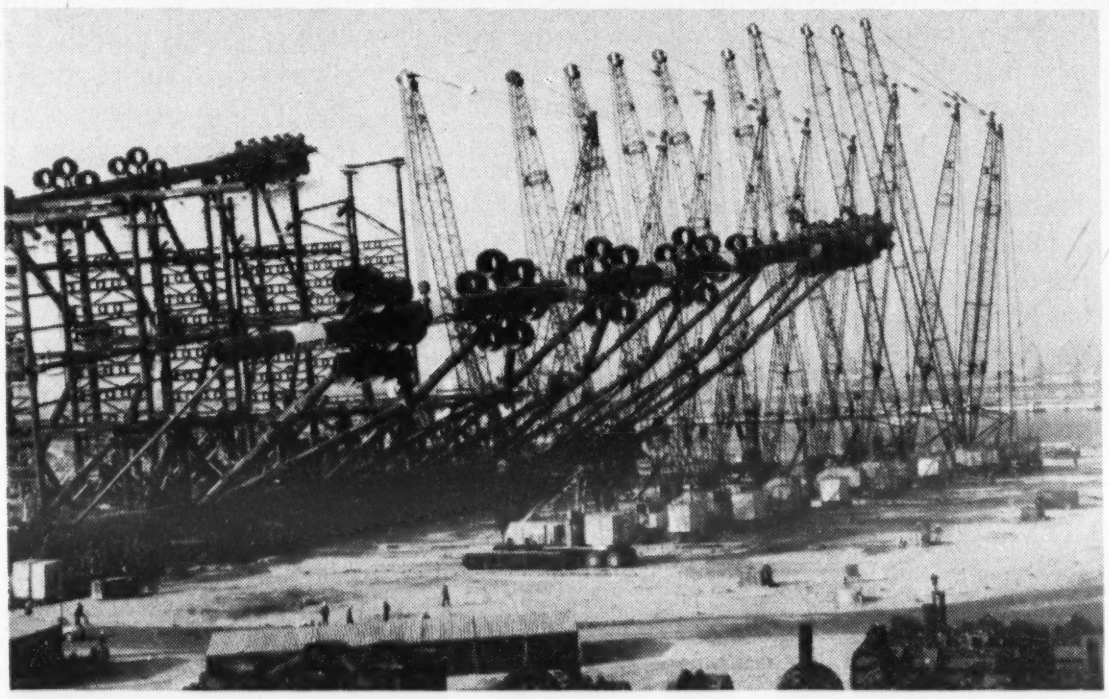
We're giving you just a taste here. To get a true idea of the magnitude of it all you must turn to the offshore oil and mineral industry itself. A dip into its two major trade publications will enlighten even the dullest mind.

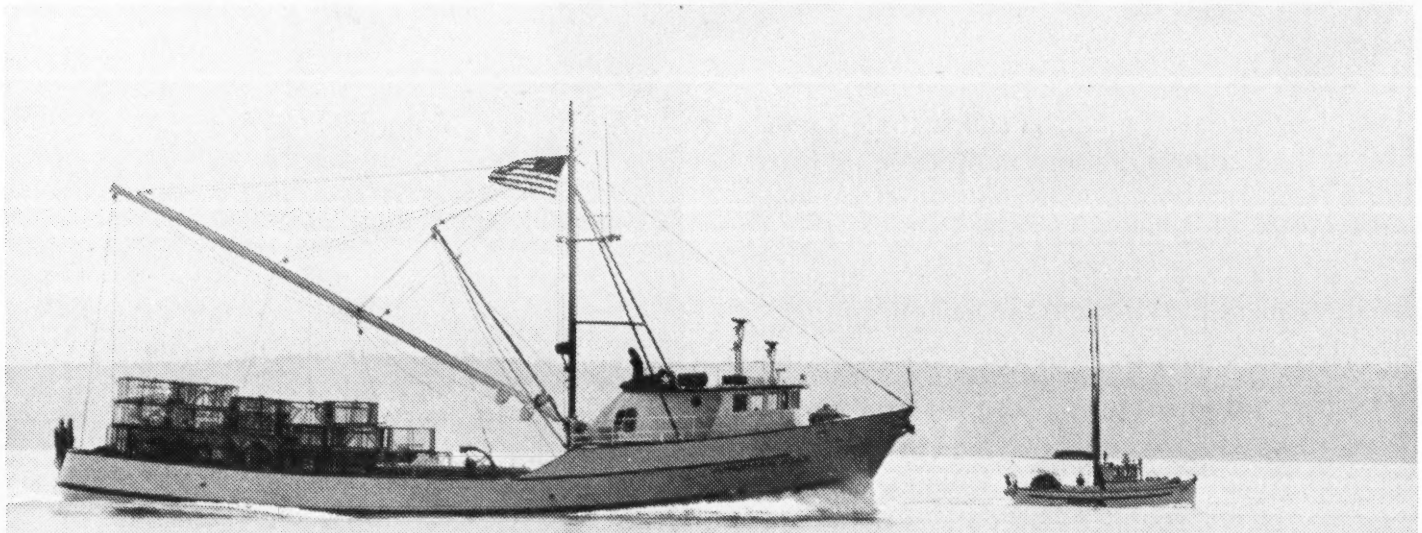
**Offshore**
**(The Journal of Ocean Business)**
**1200 South Post Oak Road**
**Houston, TX 77056**

**Ocean Industry**
**(Engineering, Construction, Operations)**
**Box 2608**
**Houston, TX 77001**

Both of these magazines are controlled-circulation publications, which essentially means you can't get a subscription unless you are in the industry. If you write for a sample copy (which is all that is necessary to get the drift), you will be served ($2 for *Offshore*; $2.50 for *Ocean Industry*).







# Future Shock in the Fishing Business

**by Joe Upton**

IN THE LAST decade, segments of the U.S. fishing industry have evolved rapidly to be among the most productive and efficient in the world. Few fisheries that I am familiar with have had less than a doubling of effort during this period. In 1970 there were less than twenty big steel crabbers operating in the Bering Sea, off western Alaska. The king crab season this year will open with more than 150 vessels, and the shipyards literally can't build them fast enough.

Five years ago, the U.S. herring roe (egg sacs) fishery was almost nonexistent. This spring saw one of the largest concentrations of herring roe fishing vessels and support craft in modern times, as over 400 vessels of all sorts and upwards of 50 spotter aircraft converged on Togiak Bay in Alaska to catch and process the herring roe for the Japanese market. (The herring arrived and spawned some two weeks early, so much of this effort was in vain!)

This rapid growth and change is due to a peculiar combination of factors. The 200-mile limit and the relation of the Japanese yen to the U.S. dollar has brought a prosperity to certain segments of the fishing business, particularly those in the Northwest, that hasn't really been seen in the U.S. since the heyday of the whaling fishery almost a century ago.

For many individual fishermen, this prosperity has been long in coming and long awaited. Many, who for years couldn't even afford to insure their vessels, are now cautiously moving ahead and ordering new vessels, and paying for them with catch levels lower than those of five years ago. The increases in fish prices are causing aging fleets to be replaced by fast and modern vessels.

But this fleet replacement and expansion by extremely efficient boats has another side to it. All over the country, around the coasts, traditional fish stocks are facing tremendous pressure. Limited entry, quotas and closed fishing areas and periods are becoming common management tools, as fishery biologists face demands from fishermen, and at the same time try to manage fisheries on a sustainable basis. Fishermen with new vessels and high payments to meet, cannot usually afford to allow their boats to stand idle very long. As the quota for one fishery is met, or the season is over, more and more boats are gearing up and moving immediately into other fisheries.

Traditionally, in many regions of the country, fleets were usually built for just one fishery, and then lay at the dock for the rest of the year. This was particularly true in the Northwest, where the salmon fleets occupied hundreds of acres of waterfront for much of the year. The higher cost of new vessels and the increased competitiveness of the

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*Joe Upton is a commercial fisherman with experience on both the East and West Coasts. He has fished for many seasons in Alaska for salmon and is now engaged in the herring fishery along the Maine coast. Joe is a well-known marine photographer – his offshore fishing photographs are unique not only for their artistic quality but also for their realistic depiction of action in rough weather – and he is the author of* Alaska Blues *(CQ, Spring 1978, p. 119), one of the best marine books we have read in years. The photographs with this article are by Joe.*

*–Eds.*

fishery have made this a luxury few fishermen with new vessels can afford. New salmon seiners launched today are true multipurpose vessels, perhaps going after herring in the spring, salmon in the summer and the fall, and bottomfish in the wintertime.

Traditionally, also, the bulk of the U.S. fishing effort was targeted on perhaps a dozen species in all, while such species as black cod and tanner crab were more or less ignored or little fished, because of little or no demand. The last ten years have also changed much of that. Today, the concept of large stocks of underutilized species waiting to be harvested and easily marketed is largely a myth. It is likely that within the next five years the spillover of excess capacity from one fishery to another and of fishermen searching out alternate fisheries will result in most presently underutilized or underharvested species being harvested at high levels. Today's modern fleets are able to change rapidly from one fishery to another as circumstances dictate, and have the productive capacity to turn an underutilized species to a threatened one in a very short period.

Probably the largest marketable U.S. fish stock not currently being harvested by U.S. fishermen are the bottomfish of the Bering Sea and Gulf of Alaska. At this time, the bulk of these fish are harvested by Japanese, Korean, and Russian trawlers and longliners. U.S. fishermen will eventually displace all of this foreign effort, but the process is likely to take as long as a decade, because of the marketing, processing, catching, and logistical problems involved. Few vessels less than 80 feet long will be able to participate effectively in this rugged offshore fishery year round.

SOME OF THE most dramatic developments of the last decade have been in the field of fishery electronics. Ten years ago, an East Coast herring purse seiner, fishing at night, might have relied almost entirely on a chart recorder and luck. Now these same boats seek the fish unerringly on the thickest, foggiest nights with sophisticated scanning sonars. New autotracking lorans interface with automatic pilots, making mid-course corrections for tide, wind, etc., and steer precisely to the spot selected. Track plotters allow bottom fishermen especially to duplicate a particular set with an error of less than 50 feet with ease, on a repeatable basis. Planes using low-level infrared light equipment developed during the Vietnam war can scan thousands of square miles of water for schools of fish in an hour's flight, and relay the information to a TV-like screen on a boat far below.

Some of these developments have technology chasing its own tail. A spotter plane working with an individual boat has an obvious need to transmit information to its boat and that boat only in a secure fashion. Secret VHF channels and code scramblers did it for awhile, but with the rapid proliferation of scanners and unscramblers, planes with literally tens of thousands of dollars of very sophisticated communications equipment aboard found the only secure way to send a message was to put a note in a bottle and drop it.

As the technology of fishing changes, so do the criteria to make a success at the business. Traditionally, years ago, with simpler boats and larger stocks, steadfastness was an *essential* ingredient – just the ability to go out there and take it – a beating from the weather, the boat, and, like as not, from the fish dealers after you got in. Production came from a combination of stamina, intuition, stamina, memory, stamina, skill, luck, and stamina. A friend, a high-line king-crab fisherman, even years ago when he had just a *60*-year-old boat to work with, once said it all – "There's no substitute in the king-crab fishery for long hours and hard work." The same applies to other fisheries, but now more than ever before, timing and cleverness are becoming extremely important with the rapid evolution and development of markets and gear. Fortunes are literally made by the fishermen who are the first with a new market angle, a new and more efficient piece of gear, or the first boats in a new fishery before it gets overcrowded. Constant awareness of new markets and technological developments is critical, especially for new fishermen starting out.

Ironically, just when U.S. fisheries are undergoing their biggest boom, perhaps ever, other events are rapidly evolving that could severely cripple and radically change that pattern of growth.

The world oil situation has been amply discussed in other forums. Simply stated, it appears that the world supply and demand curves have crossed. Due to the revolution in Iran, this occurred a lot sooner than anyone had anticipated. The forces pushing the supply curve down, and the demand curve up, are not readily subject to change or more than slight moderation. It now seems inevitable that, as time goes by, the gap between the two curves, or actual "shortfall" in the supply of oil, will increase, with more or less substantial effects on all fuel users.

Viewed from an historical perspective, the age of petroleum will be a short one, but for most of us, it is all we know, and so the prospect of the "end of the petroleum age" in our lifetimes sounds more like political rhetoric than a reality we must face.

*more* →

FOR THE FISHING industry, the situation will be especially troublesome, as these oil supply problems come at a time when many fisheries across the country are in an expansion period. In the Alaska herring and king-crab fisheries, fleet expansion has been 30 to 40 percent a year or more in the last several years. Federal policy assures fishermen of all the fuel they need, as they are "agricultural producers." However, this assumes that the government has a good enough broad energy policy to ensure that the product will be there when the boats want it. Anyone who believes that the government can guarantee fishermen all the fuel they need should take a hard look at the events of recent months. Some fishermen, and probably those with the newest boats and the highest payments, will have the distinctly unpleasant experience of finishing that boat and all of its gear – representing years of work – and being unable to get enough fuel to fish, or fish as much as they need. Unlikely? In the late spring of 1979, a new steel 108-foot trawler, out of Seattle and owned by an East Coast *oil* company *and* on a charter to the federal government for a fisheries survey, was unable to get fuel to start the survey and had to sit until the oil company arranged for fuel for the boat that it owned. An individual fisherman without those connections might fare a bit worse. Or perhaps, you might finally be able to get the fuel that you need, but after a wait of perhaps a week, let's say. For many fisheries, missing the wrong week means the loss of a substantial part of the season.

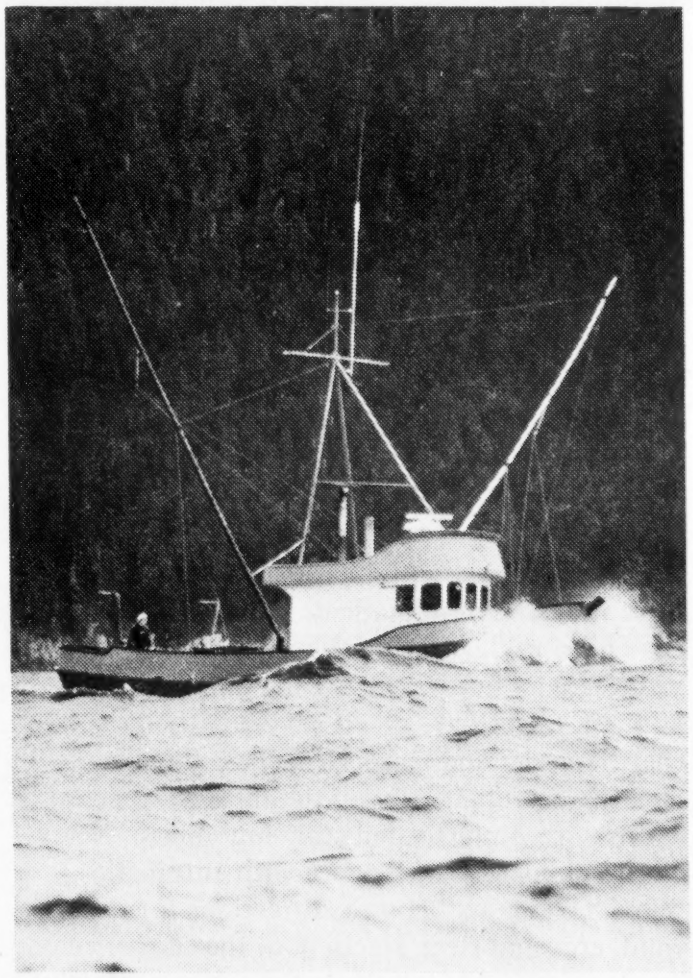
These shortages will not develop all at once, but over a period of years. For awhile, state and federal action may alleviate the effects on fishermen, but finally, all fuel users, including fishermen, will have no choice but to cut back on consumption. Unfortunately, petroleum supplies cannot be controlled by the U.S., or ultimately anyone, and sooner or later we will discover that some things that aren't desirable will have to be accepted.

Viewed in this perspective, it is unlikely that large vessels operating in luxury food fisheries and consuming large quantities of fuel will find it economical or even possible to operate when the fuel shortages get more severe, as they undoubtedly will. Some of the larger king-crab vessels operating in the Bering Sea use around 2,000 gallons of fuel a day. Sooner or later some hard choices will have to be made – even if king crab were ten dollars a pound, perhaps there are better uses of 2,000 gallons of fuel a day. Up to now, no one has been forced to make these choices.

In some areas, gear limitations or restrictions increase the number of fishermen and spread the income from a fishery around more than if the most efficient sort of gear were used. This also increases fuel usage. Mobile-gear fisheries (purse seines, drift gillnets, etc.) may have to give way to fixed-gear fisheries (fish traps, weirs, pots, etc.) in areas where they are appropriate. These changes will probably be bitterly opposed by fishermen, but unless some new and abundant liquid fuel makes its way onto the scene, economic and social convenience is likely to give way to physical scarcity.

ALTERNATE FUELS will definitely have their place in the future fisheries, but it is extremely unlikely that, industry-wide, they will be available in large enough quantities to alter the broad impacts of shrinking petroleum supplies.

Solid fuels, such as wood and coal, are available in some areas in sufficient quantities to *probably* provide for existing fleet capacity. Many of the fisheries in Alaska could be served by steam-powered vessels burning these fuels. However, solid fuels provide nowhere near the convenience of liquid fuels for modern diesel engines. For many, a return to solid fuels would be equivalent to going back to the Dark Ages. A better use of



these resources would be to make liquid fuel (wood alcohol, coal oil) at a central plant and then distribute it.

For all its shortcomings, a wood-chip-burning, steam-powered fishing boat, say, for southeastern Alaska, where there is plenty of wood, has a cer-

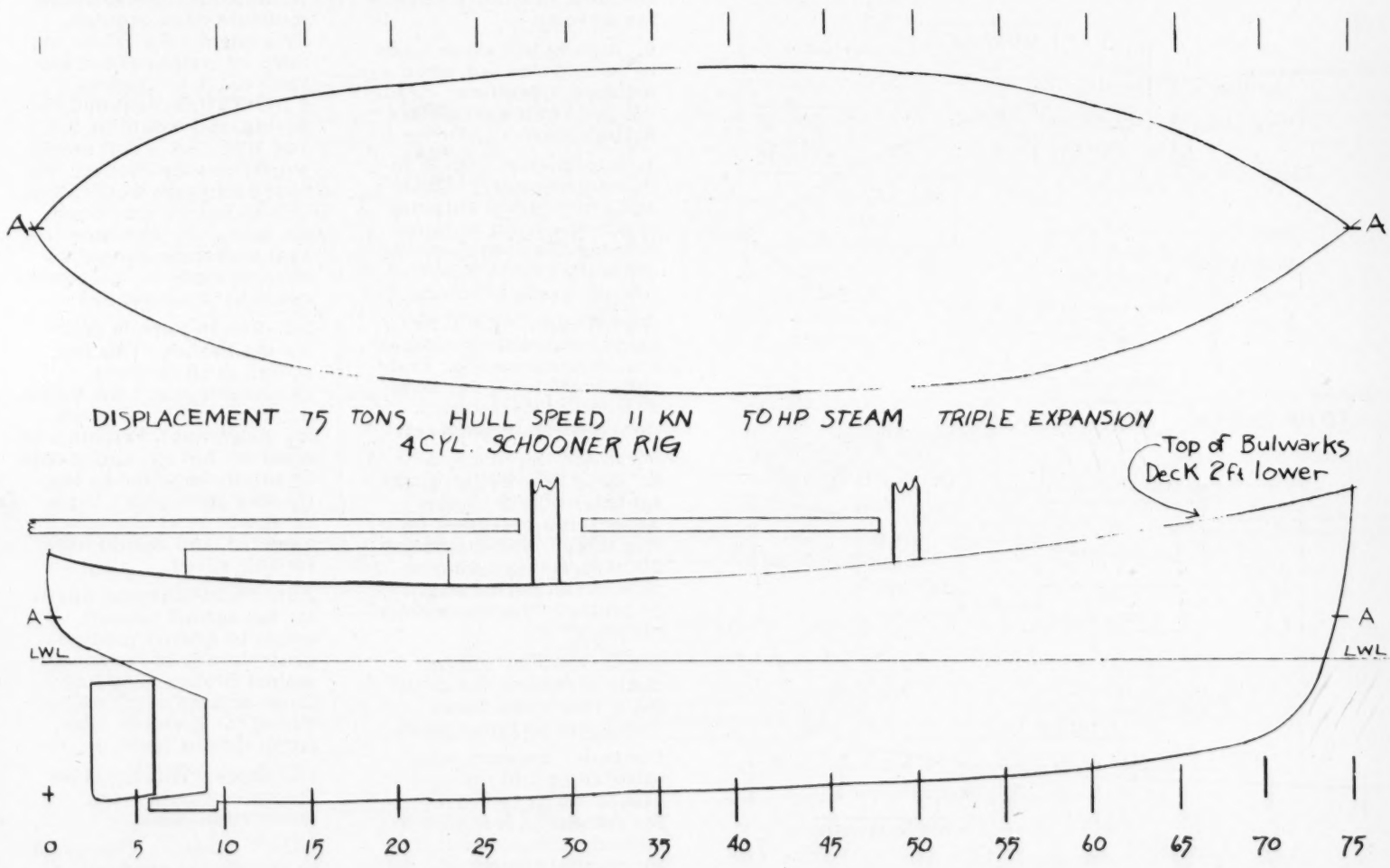
tain attractiveness. Such a boat would be more or less self-sufficient for fuel. Viewed in the context of the U.S.'s precarious source of more than 50 percent of its petroleum supplies, it doesn't seem that out of line. Especially if it were combined with a series of fueling stations along the coast – a good use for all those abandoned canneries in thickly forested areas. At these stations, wood could be cut, chipped, and dried, so that the fishboat could pull up, swing a chute over, and load up with say two or three cords for its automatic-feed, fluidized-bed boiler.

Solid fuel is definitely unhandy stuff for a fish boat. But when the crunch comes, you can bet that all liquid fuels, whether wood alcohol or coal oil, will be tightly regulated by the government, and if push really comes to shove, as it probably will, fishermen should ask themselves, would commercial fishing for luxury foods (as much commercial fishing is) be *really* assigned a priority? At least with a boat fueled by wind or wood, you would be able to go fishing when you pleased.

The broad picture of higher fuel prices, reduced availability, and higher fish prices will also present much opportunity to creative operators. As large fuel-intensive operations will be uneconomical, smaller, low-production operations will become feasible. The place for the fisherman with a small operation will always be there for the innovative individual. The dream of many to have a small fishing operation that they can actually make some money at will again become a reailty. Sailing fishboats, already making an appearance on the West Coast, will again be a part of the fishery in more and more parts of the coasts.

Beyond these very broad terms, it is hard to predict change in the various fisheries. The last ten years have produced dramatic events in the fish business, but all are more or less in a straight-line development of vessels, gear, and markets, interrupted by the usual regulatory mistakes. However, change in the next decade will probably be of a different nature, as many of the traditional precepts of the fishing business are shaken and altered, perhaps dramatically, by the oil situation.

Extremely high fish prices will present a real opportunity for the individuals who can find a way around much traditional gear and fuel restrictions. ■




*Joe Upton is one of those practical sorts with a theoretical mind, so thinking about a wood-chip-powered fishboat quickly became an exercise in working out the required machinery and a hull to put it in. His friend, Bill Smith, an engineer, soon got interested in the idea as the result of an evening of beer and fish talk, and his preliminary sketches and concepts caught our attention. Bill was kind enough to allow us to reprint here and on the following pages the initial plans and specifications for Joe Upton's proposed steel boat. We like what we see and hope the project continues.*

*– Eds.*

# Joe's Boat

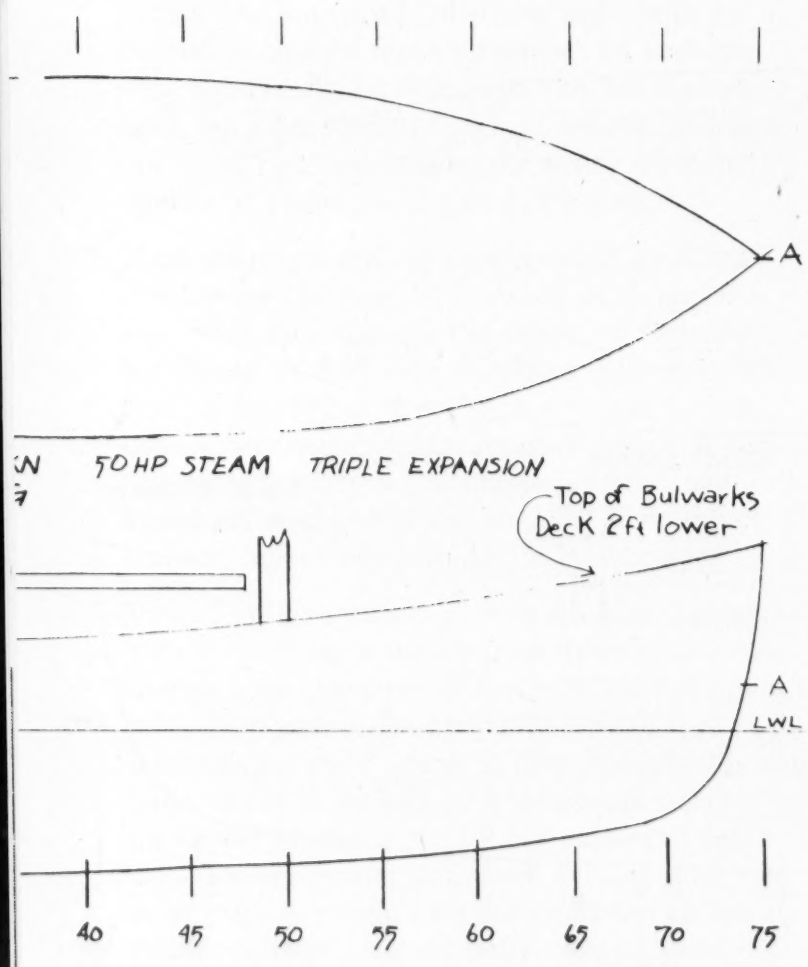
*more →*

# Joe's Boat (continued)

1. Hog (wood chipper) w/ chutes to run chips into hatches on deck, approx. 10 HP? hydraulic drive, skid mounted. Capable of chipping 50 cu. ft. of packed chips per hour. This must be supplemented by a larger onshore hogger & collector if boat is to run daily.

2. Fuel storage. Four cords = approx. 500 cu. ft. volume. Probably two bunkers, port & starboard. Fitted with ducts to channel warm air in bottom, out ventilator on deck for drying fuel. Shape of bunkers should be sloped so that all fuel can be shovelled out of a single hatch in the boiler room on either side. Bunkers insulated from outer hull? Watertight, heavy-duty hatch covers, screw down from top, w/ grates in the hatchway to limit size of the fuel.

Weight per cord (128 cu. ft. containing 90 cu. ft. of solid wood) approx 3000 lb. High heat value per




cord (12% moisture) approx. 30 x $10^6$ BTU. One cord approx. equivalent to a ton of coal. Other figures: high heat value approx. 4700 BTU/lb. (47% moisture) to 6300 BTU/lb. (24% moisture). Avg. HHV of nonresinous wood, moisture-free, is 8300 BTU/lb.

These figures from Marks Handbook do not exactly coincide, so let's take 8000 BTU/lb. as a round figure, assuming that we'll have to dry the fuel down to 20% moisture or less before burning it. What does 20% moisture mean?

Now, assume 1 lb. steam = approx 1200 BTU. Also, for the engine we'll be using, 10 lb. steam per HP-hr. Then our 100 HP engine running continuously will require:

$$100 \text{ HP} \times \frac{10 \text{ lb. steam}}{\text{HP-hr.}} \times$$

$$\frac{1200 \text{ BTU}}{\text{lb. steam}} = 1.2 \times 10^6 \text{ BTU/hr.}$$

Then,

$$1.2 \times 10^6 \text{ BTU} \times \frac{\text{lb. wood fuel}}{8000 \text{ BTU}}$$

$$= 1.5 \times 10^2 \text{ lb. fuel/hr.}$$

Now, assume 50% boiler efficiency, so about 300 lb. of fuel will have to be fed into the burner per hour. At At four cords x 3000 lb./ cord we'll have fuel in storage for 40 hours of continuous steaming.

This is a little less than I calculated last month, Joe — I don't have a copy of the letter I sent thee, but I think I forgot to factor in the 50% boiler efficiency. Is 50% a reasonable figure?

3. Fuel vat. This should hold enough for an hour's steaming, between shoveling. That means 300 lb. of hogged fuel, as above. At 30 lb./cu. ft. this would be 10 cu. ft.

The vat will be shaped so that fuel will fall by gravity from it down into the firebox, as combustion proceeds. There will be a sliding grate to block the aperture completely when desired.

4. Primary Firebox. Firebox rating 2.4 x $10^6$ BTU/ hr. Firebox volume? Firebox will be lined with high reflectance firebrick, and heat insulation outside that. The lid will lift off for easy access to inside. Firebox will operate under vacuum from stack exhaust fan. Controls: temp. gauge, vacuum gauge, butterfly damper in air inlet.

5. Secondary firebox. This will be of same construction as first firebox, separated by a baffle of firebrick. Highly preheated air will be fed in, so that combustion will be complete. Controls: butterfly valve for air inlet.

6. A grate will allow ashes to be shoveled out when required. Question: need the grate in the secondary firebox also?

7. Superheater. Specs for this superheater?? Steam exit temp; steam entrance temp; flue temp; volume of steam flow; surface area of tubing required; size of tubing; length of tubing.

Superheater coil will be easily removable for inspection & maintenance. Probably it will be in the form of a coil of steel tubing. Controls: temp. gauge at steam exit.

8. Watertube boiler: specs for this boiler?? Boiler water temp/pressure? Boiler flue temp? Boiler capacity 1000 lb. steam per hour. Size, surface area, length of tubing? Steam reservoir required?

Inside of boiler will be easily accessible for cleaning & inspecting tubes. Tubes will be replaceable.

Controls: pressure relief valve; temp and pressure gauges; water level sensor for automatic feed pump operation; water level glass for manual inspection.

Boiler will be well insulated so that there is no danger working near it. Also, the boiler will be low in configuration, so that the five heat exchangers plus exhaust fan will fit under the deck in the boilerroom (seven foot clearance in boilerroom).

9. Heat exchanger for preheating secondary burner air. Specs? Flue gas temp? Air inlet temp ambient 50°F. Air outlet 600°F. Volume of air flow? Surface area required? Materials? Configuration?

10. Preheat pressurized water specs? Flue temp? Water inlet 150° F. Water outlet temp? Volume of water required? Surface area required?

11. Preheat primary burner air. Flue temp? Air inlet 60° F. Air outlet 400° F. Volume of flow? Surface area?

12. Domestic hot water. This will be a closed thermosiphon loop with nearby domestic hot water storage tank, higher than the heat exchanger. Temp 120° F. Flue temp? Surface area?

(Alternatively, domestic hot water could be heated as needed by mixing w/ steam.)

13. Hot air heat exchanger for domestic heating and fuel drying. A large flow of air will be required, for drying fuel quickly. Air exit temp 100° F. Flue temp? Volume of airflow required? Surface area required?

Assume fuel contains 50% moisture when stowed. This might be 2000 lb. or more of water per bunker (250 cu. ft.). Then at 1200 BTU/lb. required for drying, this would be 2.4 x $10^6$ BTU, i.e., a full hour's work from the burner. The heat exchanger wouldn't be able to handle this much air, however. Probably this heat exchanger should be sized so that one full bunker could be dried per day.

14. Fan to provide draft for the burner. This fan, as well as all the heat exchangers above the boiler, must be readily removed for inspection. Fan must be rated for hot air, and should be totally enclosed so that the flue gases won't harm it. It will be electrically powered, and should have variable speed.

Automatic controls: operate fan against vacuum sensor in firebox manual controls: adjust fan speed against firebox vacuum gauge volume of air required for firebox? Size, pitch, rpm of fan?

15. Stack. This could be the hollow main mast, mounted on deck.

16, 17. Engine. This could be an existing production engine, if we can find one, i.e., from Skinner Co. or other modern manufacturer.

Alternatively, we could use a diesel block and build new steam heads, as per Daddy's idea.

Approx. specs include: 6 cylinder, 720 rpm, 100 hp. Cylinders 6" bore x 6"

stroke, MEP 30 lb. uniflow, double acting.

Steam inlet temp? Pressure?

Engine must have efficient operation at idle as well as full power. This idle can be at low pressure.

18. Marine gearbox with forward, neutral, reverse. This alleviates the need for steam reversing valving, and means that the engine can be run with the prop disconnected to give aux. power.

19, 20. Main shaft & propellor. Prop. specs: 4' diam., 30" pitch, to drive the boat at 10 knots.

21. Alternator operates off highspeed PTO. Includes rectifier to battery voltage. Possible alternator specs 3KW 12 VDC.

22. Hydraulic pump also operates off PTO. Hydraulic load includes: steering, winches, hog, other.

23. High pressure hydraulic reservoir. Should contain enough energy to run steering for ½ hour. Not needed.

24. Hand pump can be operated to keep steering in operation during power failure. Should be set up so that a few minutes' pumping can run the steering for ½ hour. Not needed.

25. Voltage regulator to protect batteries from overcharge.

26. Batteries. Lead acid marine batteries. Probably 12 VDC, although higher voltage may be needed to power the steam cycle fans & pumps. Possible battery specs: 1250 A-H, 12 VDC = 15 KWH.

27. Ventilation for battery box. This might be permanently setup set of deck ventilators, without a power fan.

28. Electrical load. These are preliminary guesses only:

Larger loads:

| | |
|---|---|
| Fuel drying fan | 600 w. (c)* |
| Burner fan in stack | 300 w. (c) |
| Feed pump | 700 w. (i)† |
| Vacuum pump | 700 w. (i) |
| Bilge pump | 1200 w. (i) |
| Deck lights | 800 w. (i) |
| Fishing machines | 1200 w. (i) |

Smaller loads:

| | |
|---|---|
| Domestic refrigerator | 200 w. (i) |
| Dom. lights, music & intercom | 400 w. (c) |
| Navigating radio & radar | 300 w. (c) |
| Domestic waterpump | 400 w. (i) |
| Other ?? | 1000 w. (i) |

*(c) = continuous

†(i) = intermittent

So maximum electrical load would be approx. 7.8 KW, if all load was operated together. Batteries should be able to handle this for a few minutes at a time.

Probably continuous load while cruising, w/ fishing machines on: approx. 3 KW — so the alternator should be rated 3 KW.

Probable continuous load at night 2/ engines stopped: Fuel drying & dom. lights = 1300 watts. The batteries should carry this plus intermittent load over one night comfortably, so the batteries should be sized at 15 KW or more.

29. Condenser. Specs for this condenser?

Must be constructed in such a way that it can be readily cleaned & painted during annual beaching. Possibly place a single pipe exterior to hull, along keel, 6" away from hull.

30. Vacuum pump. Specs for this pump? Configuration? Powered electrically. Controls: automatic operation off condenser. Vacuum sensor.

31. Hot water makeup tank. Vacuum pump will exit into this tank, which will be at atmospheric pressure. Size of this tank? This tank will be insulated, at 150° F. Tank will be filled by gravity feed from cold water storage. Automatic float valve controls filling.

32. Water filter before feed pump to keep oil & other contaminants out of boiler tubes. Configuration of this filter?

33. Feed pump. Operates electrically, automatic control against boiler water level.

Specs for this pump?

34. Cold water storage. Probably two tanks, one on either side. This will be drinking water quality, and will be used to feed both domestic needs and makeup for the steam cycle. Size of this tank: approx. 500 gallons.

35. Domestic waterpump & tank. The ordinary setup, operating at 40 psi load from this pump will be dom. hot & cold, probably fore & aft cabins. Also: fire hoses.

36. Three fire hoses, in fore & aft cabins and engineroom.

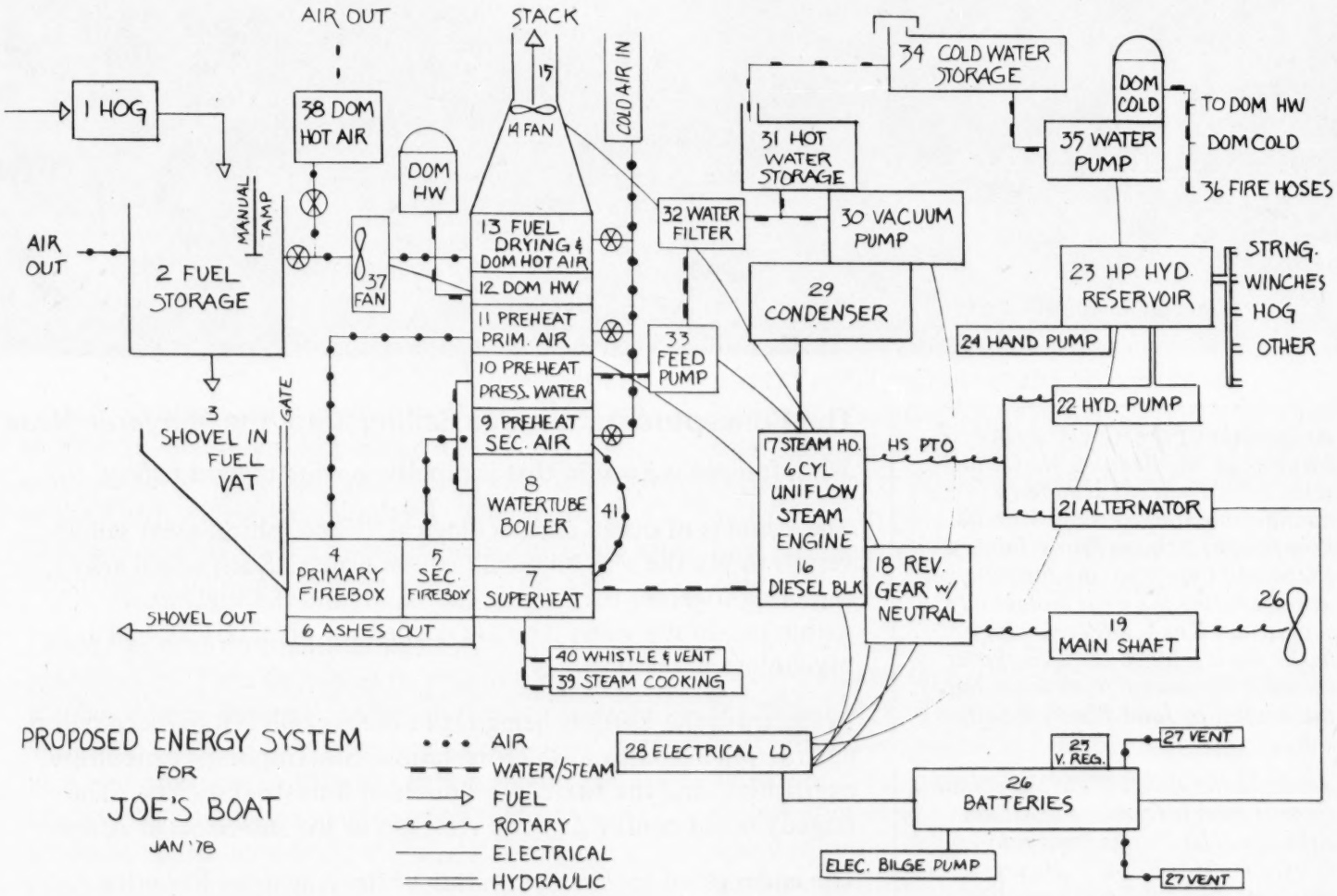
37. Fan for fuel drying and domestic heat. Ducting will be setup for manual switching to different areas of the boat. This fan should be large enough to force dry one bunker of wet fuel/day, as well as heating both cabins. First guess at power: 3/4 HP??? Temperature sensor will sound alarm & cutoff fan power above 150° F (this is to prevent lighting the bunkers on fire).

38. Domestic hot air system. Includes exit ventilators on deck.

39. Steam cooking (throttled).

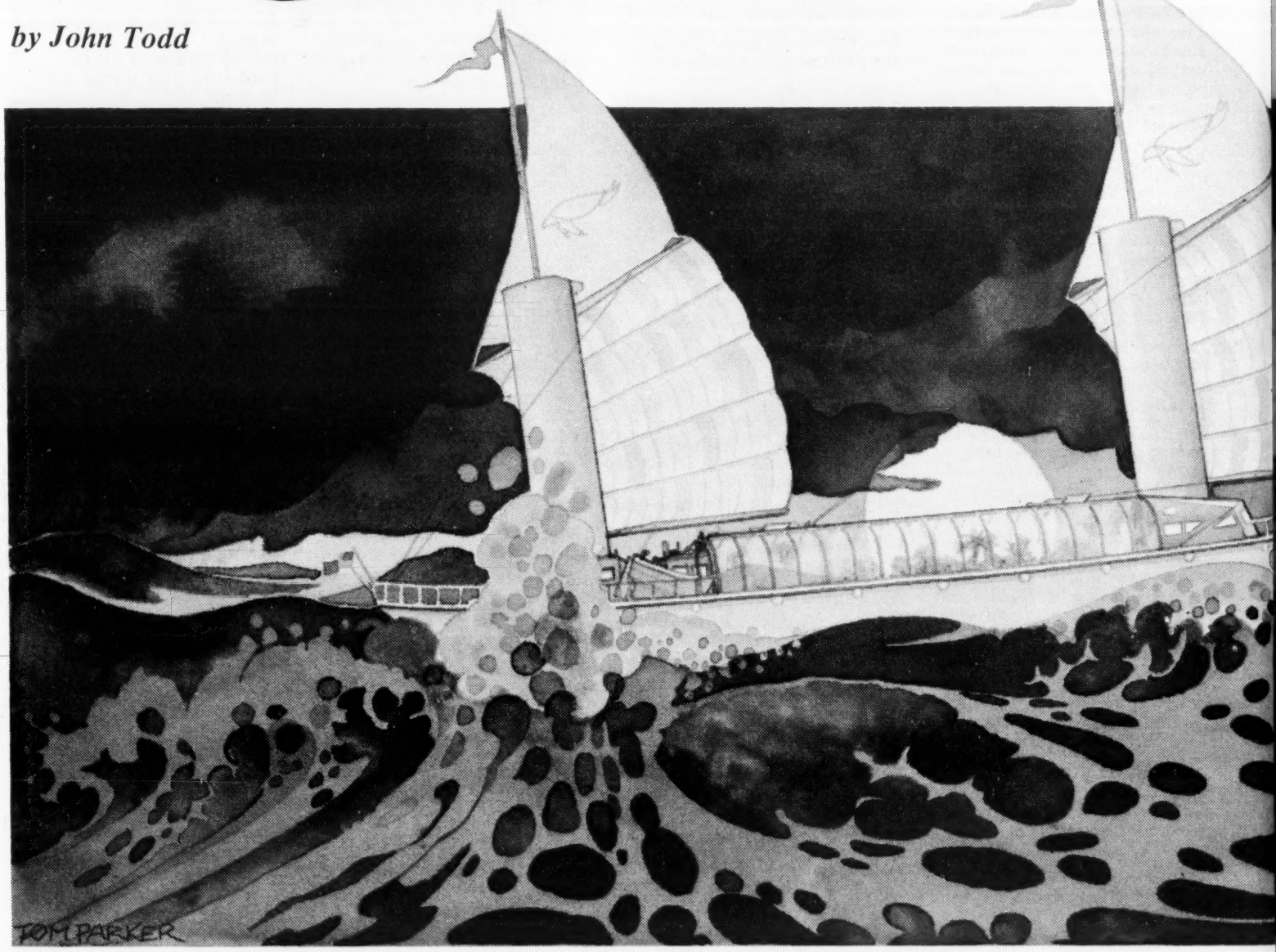
40. Steam whistles for 1) navigation; 2) emergency vent.

41. Ducting bypass with manual valves so that burner can be operated at dock for domestic heat and fuel drying without raising steam. ■



# Ocean Arks

*by John Todd*




*As Director of the New Alchemy Institute at Woods Hole, Massachusetts, John Todd has acquired a considerable track record. With its now-famous Arks on Prince Edward Island and Cape Cod, the Institute is demonstrating the most biologically sophisticated new soft technology in the world. We've come to expect constant innovation from them, but this project of John Todd's is quite a departure.*

*Among other things it's in the private sector. John is President of Ocean Arks, Inc. (10 Shanks Pond Rd., Falmouth, MA 02540). He urges me to say that "the company does not have the staff to handle general inquiries. At this time there is no further public information available."*

*For more on the designer, Phil Bolger, see reviews of* The Folding Schooner *and* Small Boats. *p.80*
*–SB*

## The Conceptualization of a Sailing Ship, the *Margaret Mead*

What follows is a vision that is rapidly moving toward reality.

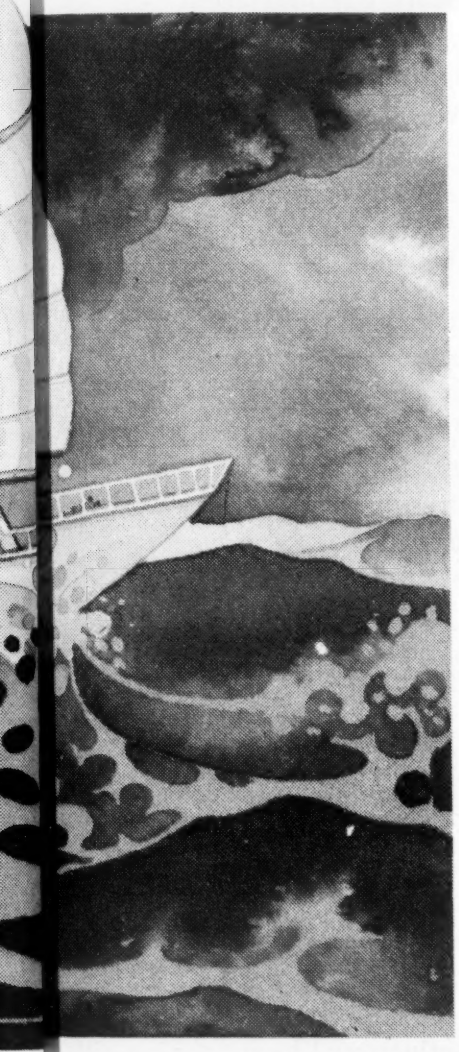
The vision is of ocean arks, ecological "Hope" ships, great sailing vessels to ply the seas on behalf of the planet. Such ocean arks can bring together the farmer, the sailor, and the *vagabundo* within us. In my view, they are needed for planetary as well as psychological reasons.

In sad truth the Earth is being raped biologically. Rapid ecological destruction accompanies deforestation, contemporary agriculture, overfishing, and the toxic byproducts of industrial society. The tragedy is not confined to the Amazon or the sub-Sahel in Africa.

The endangered species committee of the American Fisheries Society has announced that 251 species of fish from northern Mexico, the U.S., and southern Canada are seriously threatened or are in danger of becoming extinct.[1] Such fishes, many of which are ultra-sensitive to toxins and habitat destruction, are the warning canaries in the global mine. Their message to us is ominous. Recently I wrote an article entitled "Where Have All the Fishes Gone"[2], lamenting the loss of wild stocks of food fishes and the

absence of replacement or alternate species. Stocks for fish culture and aquafarming are in short supply on a world basis. New England buyers, for example, purchase our young live eels at up to $1,000 a pound for air freighting to Japanese eel farmers whose own *Anguilla* stocks are in short supply.

It is not just fish: Trees, grasses, birds, flowers, and even insects and smaller creatures are turning up on the missing list.



The global biological problematique took on a new dimension for me not long ago after a conversation with the poet/naturalist Gary Snyder. We were talking about our love of the Mediterranean region and its ecosystems. We share a belief that the Mediterranean world of the ancients no longer exists, biologically speaking. Over the past 10,000 years our agriculture and our livestock have slowly undermined its living integrity. But it did strike us that the Mediterranean we yearned for might yet exist . . . in pieces or in incomplete ecologies scattered around the world. We speculated whether it might be possible if all the Mediterranean climate areas – the Mediterranean itself, parts of California and Chile, bits of West Africa, a section of Australia, and possibly the Indian subcontinent – were recombined biologically somehow at the Earth-wide ecosystem level. Then possibly a "Mediterranean" with new component parts but with an ancient structural integrity might flower again.

Often I ponder on the meaning of bioregional redundancy. I am beginning to perceive it as a source of hope beyond classical notions of conservation at a level of stewardship in which the biologist attempts to fill some of the ecological black holes that human activity has created on land and in the sea around the world. Nature rendered self-conscious.

In the Arks and bioshelters at New Alchemy, we have tried to fill ecological gaps to prevent pest outbreaks and to provide organisms that carry out specific functions of control, regulation, or nutrient recycling. Some of these organisms, such as parasitic wasps from India and nitrogen-fixing aquatic ferns from Indonesia, come from halfway around the world. They do not, in fact cannot, live in the wild on Cape Cod. We have sought to fill a gap that was specific to the interior environment of the bioshelter. We may know enough some day to do comparable work on a bioregional and ultimately a world scale.

On an immediate and pragmatic level, trees are needed for reforestation and fishes must be made available for culture. There are many species of plants that are in short supply and animals for which there is a real demand. The studying, saving, and culturing of biological material will be the basis of a nurturing science and a major new intellectual frontier.

The stewards of the Earth who become involved in this quest will need a symbol and a pack horse. They will need, as well, an information carrier that connects knowledge of the various components into a comprehensible whole. I see an ocean ark, a majestic sailing ship with living and growing plants and animals as cargo, as the appropriate crucible for an epistemology founded on a reverence for life.

The ocean ark should be a sailing ship for mythopoetic as well as practical reasons. It must create a balance between the wind (propulsion), the Sun (by culturing biological materials), the Earth (as beneficiary), and the water (the connecting highway). It would become a symbol of travel in a solar age. The excitement stirred by the Tall Ships in 1976 is a harbinger of this possibility.

The practical reasons for sail are equally compelling. Motorships are fuel hogs. The largest ships, those over 1,000 deadweight tons, consume between 5 percent and 8 percent of the oil used by non-communist nations.[3] Ocean transport in large ships uses 200 million barrels per year. Since 1973 the costs of bunker oil have climbed nearly ten-fold and future supplies are not assured. Fuel costs now represent more than 30 percent of the operating expenses of a modern vessel.

A study sponsored by the U.S. Maritime Commission in 1974 looked into the feasibility of building sailing cargo ships. They concluded that as long as fuel prices were below $11.25 per barrel, sailing ships would be marginally uneconomical. If fuel prices climbed above $11.25 per barrel, then on many routes at least, the sailing ship would become cost competitive.[4] Today's fuel costs are inching up to double the study's break-even figure for sailing ships.

A modern sailing ship would be blessed with technological changes very much in its favor. The forward motion of Cape Horners and other great steel sailing ships of the turn of the century was slowed

by 40 percent (on an average) because of the proliferation of fouling organisms on their bottoms. New antifouling materials can be applied to steel to reduce this enormous drag.

Rigging has been transformed as well. Miles of expensive wire are no longer needed to support masts and sails. Unstayed masts have been developed and methods of shortening sails with automatic reefing have come of age. Aerodynamics as a science has emerged since the heyday of sailing ships. Its findings can be well applied to sailing-ship design.

Crews will be smaller on modern sailing ships and will have an easier time of it. Satellite navigation, computers, radar, and radio communication allow for better planning of routes and the avoidance of many major storm systems. As a result voyages will be faster and safer.

My interest in ocean arks as sailing ships is personal. I have asked myself whether I would be willing to shoulder the responsibility of conceiving, building, and operating an ocean ark that was not a sailing ship. The answer comes up each time – no! For me, sailing is at the core of the ocean ark concept. It is love of the sun, wind, and organic life together that fuels the dream.

## *The Prototype: The* Margaret Mead

The prototype ocean ark is to be named the *Margaret Mead* in her honor and her memory. Nancy Jack Todd and I travelled with Margaret to Java and Bali in 1977 and came to love her. She had a finely-tuned sense of place and home combined with one of world citizenry. Ocean arks will reflect a bringing together of these opposites. Margaret knew I was working on ocean arks and approved of it. Not long before her death I showed her my sketches of the vessel. She talked of how Doxiades had used a ship for gathering people to think and plan together at sea. She seemed pleased and said that good things could come of it.

*Margaret Mead*

The ocean ark concept has developed slowly over several years. I began by visualizing floating farms – bioshelters mounted on barges for growing fishes, oysters and vegetables near "low rent" offshore islands. When the crops were ready the barges would be towed to "high rent" city harborfronts, where they would double as floating markets for retail sales. I am still working on this idea.

After a time, however, the floating farms started to sprout small steadying sails. Then I got hooked on sailing barges, particularly the type common around the turn of the century in waters off New Zealand. Piece by piece the notion of a world voyager, a sailing greenhouse that used the sea to feed many of its organisms, began to evolve. The design process focused at this point.

The first ocean ark will be an intercontinental transporter of live freshwater and marine fishes, molluscs, and other aquatic organisms. It has to be able to propagate and culture tree seedlings in large numbers. As far as I know, culture and growing of food and forest organisms at sea is a new idea. Captain Bligh, the master of the *Bounty*, was content to be able to keep breadfruit tree seedlings alive enroute.

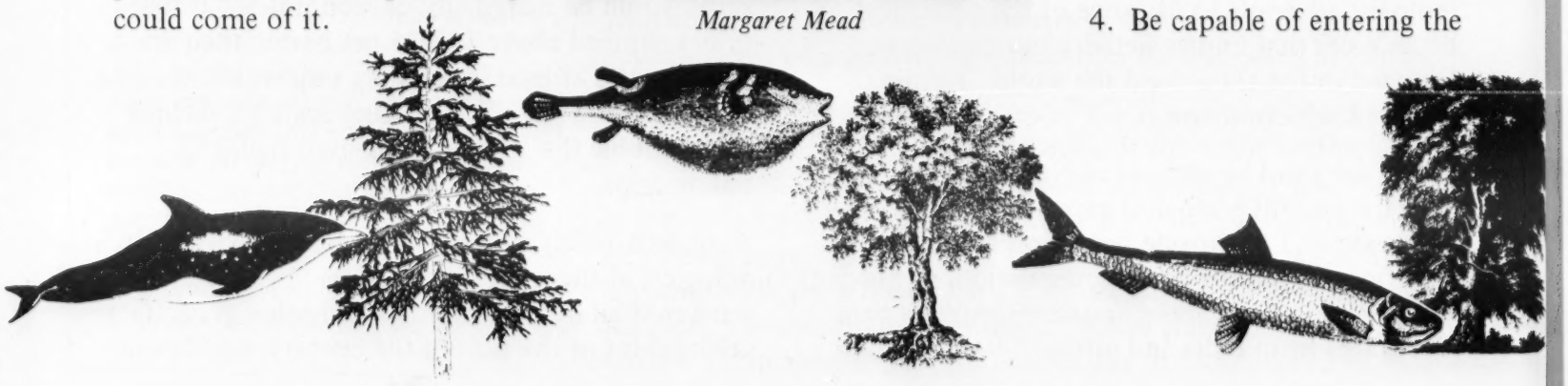
I am not a maritime expert nor even a savvy boat person with a wide range of ocean experience. My influences have come from New Alchemy land Arks and from the writing of others. Alan Villier's book **The Way of a Ship** was a powerful input for me. For a long time I have been fascinated by Chinese junks, Persian dhows, and Baltic traders. Out of this hodge podge of influences I have drawn up the criteria for the *Margaret Mead*. She must:

1. Sail well and remain relatively upright.

2. Be safe and relatively comfortable at sea.

3. Be maneuverable under sail.

4. Be capable of entering the



great rivers, including the Amazon, the Orinoco, the Congo, and the Yellow River in China, yet still be able to ply the high seas.

5. Have a small crew, three watches, and good accommodations.

6. Have excellent ground tackle for anchoring during storms.

7. Have motorized propulsion from pusher (yawl) boats normally carried on board to be used as tugs for moving in rivers, crowded areas, and through calms.

8. Be a well-found steel ship.

9. Employ the latest electronics, including radar, computers, satellite navigation and weather reporting, and sophisticated communications gear.

10. Employ aquatic and water-quality monitoring and have on board weather-monitoring equipment.

11. Be beautiful but not necessarily a nostalgic replica of a 19th-century vessel.

### *Ocean Ark Economics*

During the last ten years with the New Alchemy research, I've become fascinated with the relationships between ecology, economics, and the points of their convergence. I think a point has now been reached in the development of an applied ecological science and its associated technologies to proceed directly with building and operating ocean arks. I would operate under the umbrella of a for-profit corporation along orthodox economic lines. If ocean arks could pay their way, we might convince more than a few doubting Thomases that there is potential in sailing ships and in ecological development.

The cargoes for such arks are fascinating to contemplate and to plan for. As a biological explorer of sorts for twenty years now, I have come to know the whereabouts of many different kinds of useful and valuable creatures, especially fishes. I have learned how to culture, breed, or propagate some of them.

The basic strategy for the ark would be to capture fishes and other aquatic animals when they are very young and plentiful, before they succumb to the vicissitudes of the ocean's food chains. They would continue to grow during transport to other parts of the world and be delivered ready for final growth or fattening by fish farmers. If several hundred thousand (or possibly several million, depending on the species) were to arrive at their destination in good health, the value would be considerable. At New Alchemy we currently pay up to 55 cents apiece, plus shipping, for the young fishes that we subsequently culture.

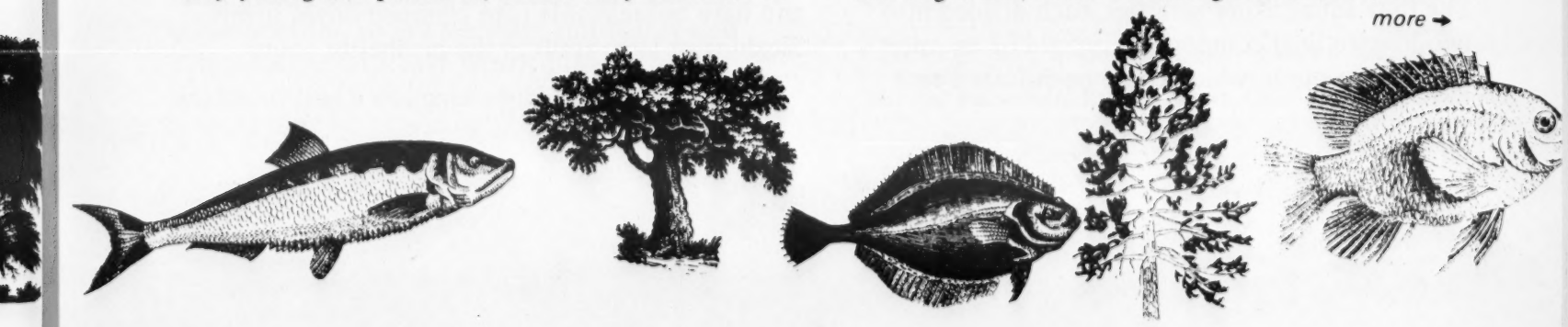
I have identified about a dozen such aquatic cargoes around the globe. This list does not include medical or research organisms, nor exotic materials like colorful and valuable aquarium fishes, which are now transported in jet aircraft with enormous losses. Such fish could be cultured on board without the stress and mortalities of container shipping.

Tree propagation on the ark might be less exciting financially but would be very important ecologically, especially if the right kinds of trees were chosen. Perhaps a quarter of a million fruit, nut, and fodder trees could be propagated per voyage, helping to diversify the ship's economic base. The trees could pay for operating costs, insurance, and possibly even financing if a demand for agriculture forest trees were created.

Although my economic summary here is brief, I do not want brevity to imply a poor financial basis for the idea. Quite the contrary: The more I investigate the idea of living cargoes (and I have confined myself to cargoes that are neither endangered species nor ones whose harvesting as fry would harm parent ecosystems) the more I think ocean ark farming on the seas is practical. I am attracted by the fact that quarantine conditions exist on the ship for the assessment of pathogens and pests, which air transport doesn't allow for. A pathologist could be part of the ocean ark's crew.

Ideally the success of the first vessel would pay for technological development and innovation and for the location of cargoes and markets. Subsequent ocean arks could then help provide the financial foundation for a fleet that would include ships capable of handling passengers. A new breed of intercontinental travellers who want to use aircraft less might find ocean arks an agreeable alternative.

*more* →

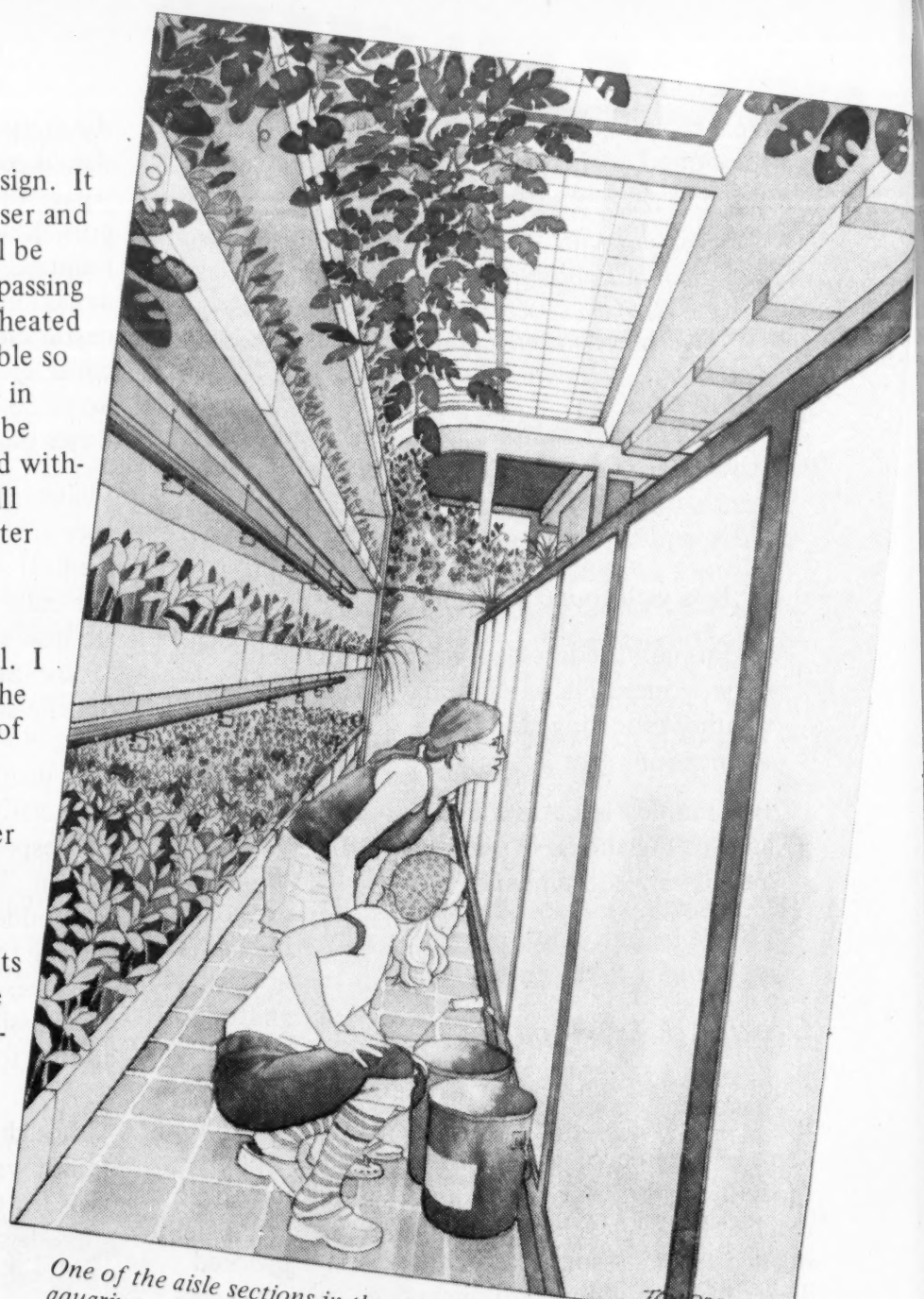


### *Bioshelter or Greenhouse*

The greenhouse is integral to the ship's design. It will function as a solar collector and diffuser and as a solar still. The aquaculture inside will be photosynthetically based. The sea water passing through the aquaculture elements will be heated by the sun. The rate of flow will be variable so that the temperatures can be optimized – in northern latitudes the retention time will be greater to allow for more heat to be stored within the bioshelter. The greenhouse roof will double as a solar still condensing fresh water on its inner side for the trees, freshwater aquaculture, and human needs.

The roof will be of a strong, clear material. I have a real thing about being able to see the outside and do not like the visual barrier of translucent bioshelter coverings. Imagine working or pruning a tree while watching the waves rising up and disappearing under the ship.

The skin of the bioshelter will be of reinforced glass or one of the clear plastics. Its strength will have to approach that of the steel in the hull, as waves will come crashing over the greenhouse during storms. Another requirement is that the greenhouse be a structural component of the ship and not a structure placed on the deck. I have been led to believe that the seemingly conflicting requirements of transparency and strength can be met.



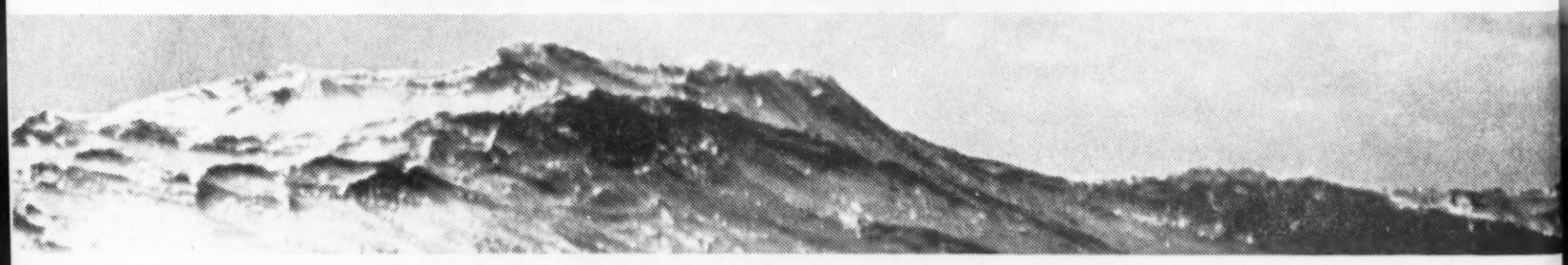

*One of the aisle sections in the ship's greenhouse/aquarium. The crew members are watching the fish swim in the large tank.*

### *Aquaculture*

The aquaculture facility would employ the same design principles as our solar algae ponds at New Alchemy in which a translucent cylinder and a biologically balanced, photosynthetically-based ecosystem support the fish. My minimum requirements are a 50,000 gallon, light-transmitting and flow-through system in units extending the full length of the greenhouse interior. Planktonic life, including phytoplankton, and several million young fish could be contained in the tanks. The plankton would serve as feedstock for the fish, produce essential gases, especially oxygen, and utilize and purify the fish waste products, such as carbon dioxide and ammonia.

The four aquaculture facilities, each divided into two longitudinal components, would be an open loop to the ocean which could be switched to a closed cycle in polluted waters or when higher temperature requirements necessitate recirculation within the bioshelter enclosure.

During the aquaculture open cycle, the ship would be like a mechanical Great Blue Whale, with sea water laden with marine life passing through it. Plankton-filled waters would flow into the forward section of the greenhouse and then enter each of the aquaculture components where the cultured species would filter out their feed from the flowing water. Ultimately the sea water would be discharged back into the sea again. When at sea the aquaculture chambers will be filled to the brim and have unbreakable tops clamped down firmly. Sloshing or large spills in the bioshelter could endanger the ship.



The present design allows the aquaculture to be switched from a marine open or semi-open loop to a closed, recycling, freshwater system for transporting valuable freshwater fishes, such as several of the Amazon River species. They could be caught young and grown on the high seas on their way to Europe and North America. Large plankton samplers towed astern could collect some of their foods directly from the sea.

### *Tree Crops*

The tree-propagating facility could use the latest propagating techniques – misting units, hormone preparations for rooting cuttings, and possibly a tissue-culture laboratory for rare or endangered plants. Several hundred thousand (actual numbers will depend on the types of trees and the size of their roots) will be grown per voyage on four tiers or compartments situated against the side of the greenhouse. The tiers will slide out like drawers for access. The tree racks will have auxiliary light and mist propagators extending almost the full length of the greenhouse. Enough space between the tiers has been allowed to permit the cultivation of deep taproot species.

I plan to seek out native trees in coastal areas that are either very productive or have some other special quality. They will be cloned from cuttings treated with special rooting compounds while attached to the parent trees. This technique allows the original trees to remain unharmed in their natural state. In this way the best genetic tree material available can be delivered to individual farmers and large-scale agricultural forestry projects. The possibilities for land restoration and agricultural diversification with the ocean ark are almost limitless.

Food gardens for the crew will be on platforms suspended like swings from the girders of the greenhouse.

I have touched only on some of the technologies of the ocean ark. We will spend the next year detailing and evaluating the solar and biological components, as these technologies have not yet been adopted for the unpredictable and rugged ocean environment.

### *Design of Modern Sailing Ships of Commerce*

From the point of view of naval architecture, ocean arks are, to say the least, unusual vessels. From the outset I have worried that I would be unable to find a designer capable of bridging the chasm between sailing vessels and freighters, and then again between the freighter and a sailing bio-shelter. Several times I almost gave up because I thought the designer I was looking for might not exist, and I had gone as far as I could go with the concept. I paid attention to the new commercial sailing projects. Dynaship Corporation in Germany and Palo Alto, California, is developing advanced square-rig designs for cargo ships. Ocean Carrier Corporation of Sausalito is working on their own fore and aft rig with a bipod mast system. Both have yet to build a ship to test their ideas. A group at M.I.T. made up of veteran ship building and marine expert Lloyd Bergeson, Professor Henry Marcus, and yacht designer Frank McLear, is evaluating sailing ship potential and developing rigs based on the roller reefing systems common on modern yachts. Some aspects of their work were pertinent to some of my own needs. Their ships were far from ocean arks, however, as they were big vessels planned to substitute for and compete with modern freighters. They would require ports, deep waters, and regular shipping lanes.

Another significant project is being undertaken by Dick Newick, Jim Brown, and Phil Weld – the "Big Three" in the world of sailing trimarans. They have created already a multihulled mini-freighter and fishing boat that they describe as a workboat for the Third World. The prototype, called *Small Is Beautiful*, in honor of the late E.F. Schumacher, is not only useful, it is a beautiful and well-thought-out vessel.* As much as I was attracted to their work, I was not sure that multihulls would be appropriate for a ship that was to be as large as the *Margaret Mead* and a world traveller.

On another front, several yacht designers have turned their hands to fishing vessels powered by sail as well as engines. Most of these are being developed along traditional lines. Foremost among them are Edwin Monk, William Garden, and Jay Benford, all West Coast designers.

To design an ocean ark I needed an innovator, experienced but at the outset not committed to any given approach to commercial sailing ships; someone willing to play and play well by a different set of rules in the same old ball park, namely the oceans.

One name that kept cropping up was Phil Bolger

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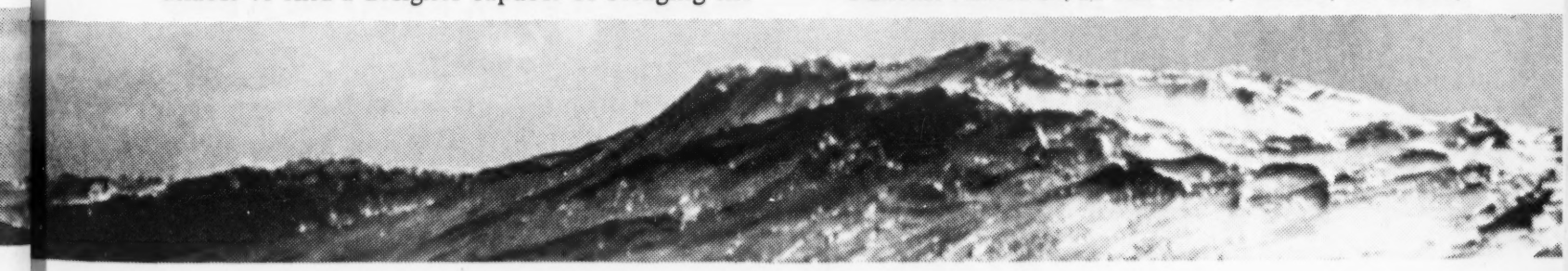
* See "For Third World Fishermen — Small is Beautiful" by Chris Cornell (*National Fisherman Yearbook, 1979*, National Fisherman, 21 Elm Street, Camden, ME 04843).



of Gloucester, Massachusetts. He pioneered several new areas in boat design, including construction methods, unstayed rigs, and shoal draft vessels. To some people in the boating world he is anathema. They discourse at length on his mistakes, usually omitting to state that he has been the one to chronicle his design failures. I knew he had designed some ugly boats but also many vessels that are jewels. Although he is best known for his small boats, he has designed commercial sailing vessels as well. I had seen his drawings for a sailing coal carrier commissioned by the boatbuilding firm of Edey and Duff, and I knew he had an interest in work boats. What finally tipped the scales was a cruising sailboat he designed for a group that included my father. It was called *Manatee*. It was fast, different, with shoal draft and an unstayed rig. To my eyes she looked rather sexy. I decided that I wanted Phil Bolger to design the ship.

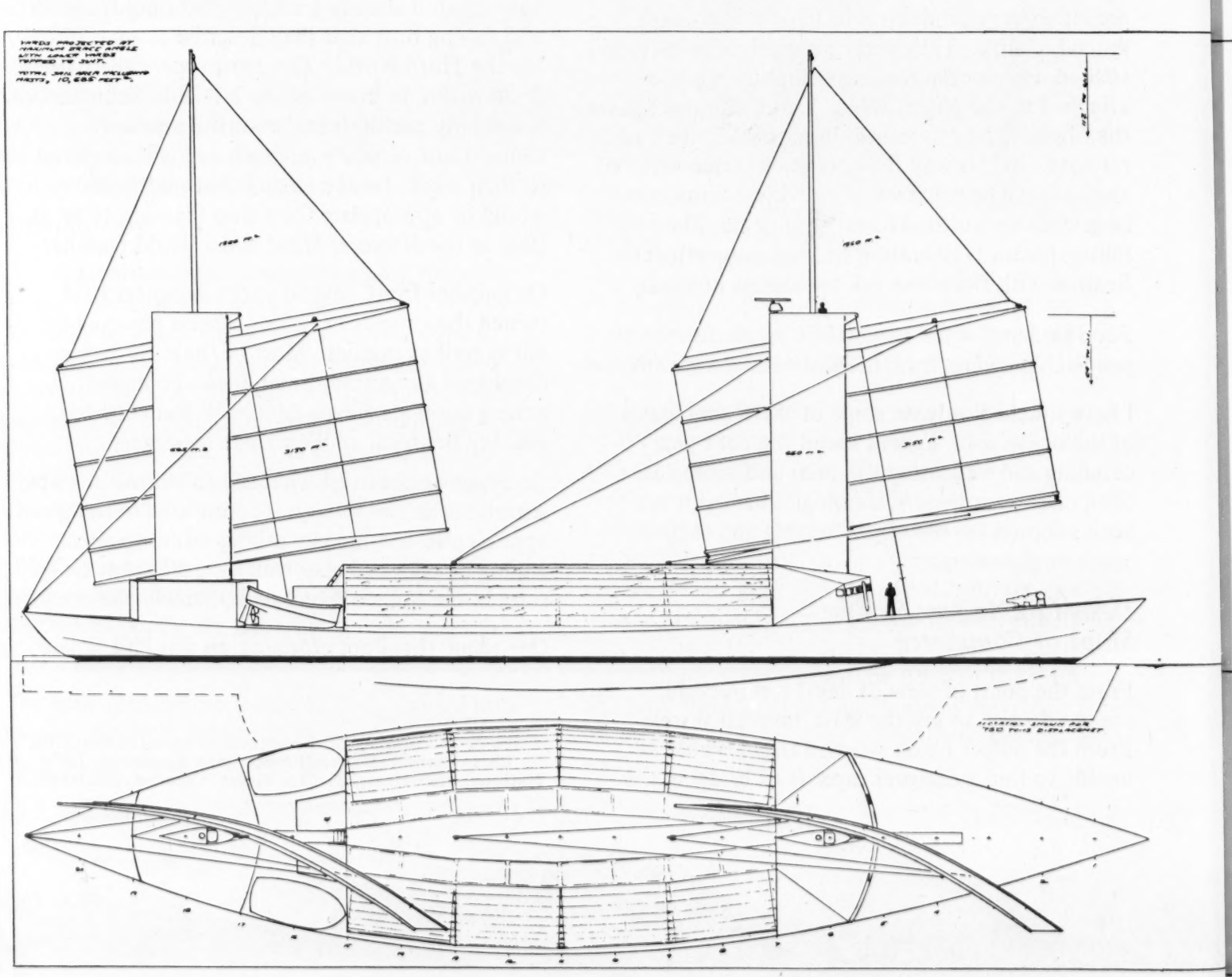
At first approach he was pretty cool to the idea of an ocean ark. As he learned more about the *Margaret Mead,* its mission and its economic base, his interest was captured. After our first meeting I sent him sketches and details of the ship's requirements. The next step was up to him.

## *Preliminary Designs of the* Margaret Mead

Phil Bolger's studies and early sketches resulted in several quite varied types of vessels, all potentially capable of doing the job. The lengths, shapes, and rigs were amazingly different from each other. It became apparent to me that there were undoubtedly a number of ways of meeting my requirements.

The long, slim vessel shown in Figures 1 and 2 represents the direction in which we have decided to head. The drawings represent the concept as initially conceived, before having been critiqued by experts in rigging, hull, and greenhouse engineering. The design has evolved beyond what is shown here but the basic ship has not changed fundamentally.

The rig is unusual. The stayless lower masts are aerodynamically shaped cantilevered vertical wings. Now I must locate an aerodynamicist/ structural engineer capable of assessing the airfoils and their influence on the performance of the ship. The ship is a square-rigger with a number of modern changes. Sail tending is done from the deck. The yards and battened sails blend attributes of Chinese junks, traditional square-riggers, and modern aerodynamics.



Here is what the designer has to say:

> Square rig seems indicated for the reasons it always has for intercontinental work, principally being statically balanced and with all spars under positive control at all times. I think perhaps the upper yards should normally stand, with the lower yards hoisted to them for furling; I envisage topping and furling with motors mounted on the upper yard and controllable from the deck. The topsails are also supposed to be handled from the deck, with head downhaul set up as the halyard is slacked, to bring the sail head-down on the forward side of the course; then one clew at a time would be brought down, also with downhauls for positive control. I'd like to see all this done with single parts carried to foot-switch dead-man capstans or niggerheads so one person can tail each line, but not to go to reel winches which my experiences have led me to distrust strongly.

The rig as shown leaves the greenhouse exposed to direct solar radiation. Initially I felt this to be essential for the aquaculture and agriculture.

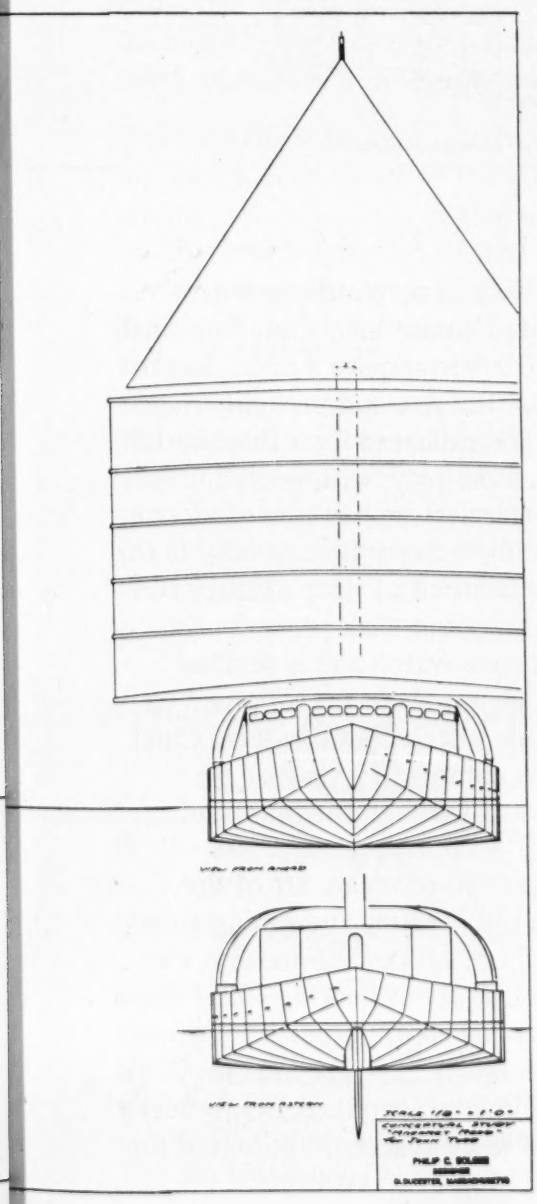


*Fig. 1*
*Phil Bolger's radical design for the 210-foot* Margaret Mead, *a sea-going and river-capable greenhouse and cargo ship. This Fall (1979) the Massachusetts firm of Edey and Duff is building a quick-and-dirty ¼-size version of the ship (50 feet long, 9-foot beam) for testing on a ¼-size ocean, Buzzard's Bay. If the unusual aerodynamics and hydrodynamics of the model prove out promisingly, then work proceeds on the full-scale version.* CQ *welcomes comment on Bolger's design.*

Subsequently I have come to suspect that there will be enough light reflected off the sea and the sails to allow for an additional mast and yards over the greenhouse, giving a greater sail area. She might also be rigged with several fore and aft sails that would improve her windward ability and maneuverability.

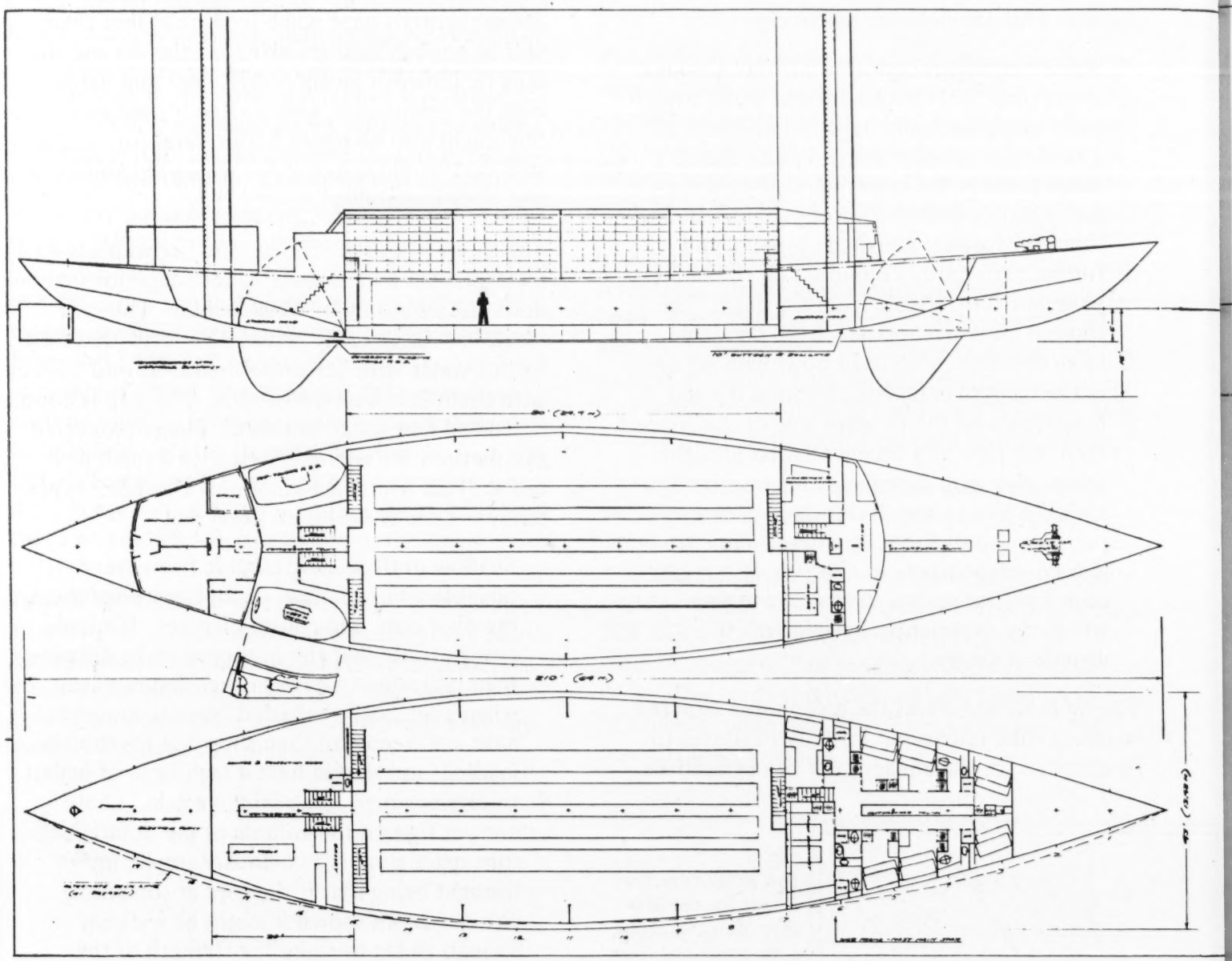
The ship's length is 210 feet and her width is 43 feet. She has a hard-chine canoe shape for shallow draft and economy of construction. This will result in a fairly easily driven hull. She draws six feet of water with her centerboards up and 16 feet with them in lowered positions. The ship is double bottomed and water ballasted. Bolger pioneered this method for sailing vessels with a small boat called *Triad* whose sea-kindliness exceeded expectations. Here is Bolger on shoal draft:

> Shallow draft seems desirable from every possible point of view – speed, seaworthiness, low first cost, and choice of ports. It's however possible that she may need to be deeper than indicated to have enough displacement when adequately ballasted; she ought not to have less freeboard than shown at maximum loading, and should have a high ratio of ballast to displacement to be safe in a gale. I have not yet figured the volume of the double bottom space since it's obviously ample, my thought being that if it's kept at something like the depth shown it might be a strong enough girder to make the strength of the greenhouse redundant or at least relieved of heavy stress.

## *Auxiliary Power*

Instead of designing her with full auxiliary power, which is calculated to be about 25 percent of the engine size of a comparable motorship, we opted for two small tugs that would push or pull the vessel through the doldrums, maneuver it into crowded harbors, and push it up into rivers. Again the designer:

> Full motorship power would require her to be of considerably deeper draft to be reliable in a seaway, and would certainly make her uneconomical if its cost was added to that of the sailing rig. Two heavy tenders are shown, resembling seine net tenders, very heavy and blunt with sizeable diesel engines. Up to nine or ten knots, it can be assumed that all the resistance is wetted surface (unity speed for her length w.l. is 13.86 knots; wave speed is 18.75), and squaring up from *Triad*'s speed under power it seems that the engines noted would drive her ten knots in dead calm and smooth sea. My instinct is to doubt this, and



in any case the type of small boat indicated would itself be incapable of this much speed. As may be, the kicker-boat system would seem to be as good as any for propulsion in the doldrums (probably better as their props won't come out of water so easily in a long swell); very much better for harbor maneuvering, and have no drag under sail and are relatively simple to maintain.

### *Accommodations*

The bridge of the ship is forward. The person at the helm will steer from a protected position. The ocean ark will have much of the technology of a modern ship or an aircraft, with satellite navigation, Loran C (an electronic navigation system), weather reporting, computer, radar, and communications. The captain, chief biologist, mates, engineer, crew, and staff would be quartered in the forward part of the ship. Phil Bolger has this to say:

> Assume that her crew will be made up of couples, as seems most desirable for such long voyages. Consideration of including capable children say twelve and up would be worthwhile; an integrated community including small children seems to me to require a much larger ship, at least twice the size and probably more. Eighteen berths are indicated for a three-watch system; one watch on duty, with cook and biological watch-standers on call if needed; one watch on reserve for recreation but available for squalls; one watch assured of sleep. Galley run as a short-order restaurant with three cooks. Master commands one watch and is berthed handy to the bridge but there are supposed to be three responsible watch commanders. Chief scientist's quarters command a view of the greenhouse-aquarium through the bulkhead.

The lounge and projection room are aft of the greenhouse, as is the ship's galley and dining area. Below is a machine shop, offices, laboratory, and darkroom. We are presently evaluating a hull shape with a more conventional stern shape. This would allow much more useable deck space near the stern for handling and hauling live cargoes. Below decks there would be more work space and potential for increased accommodation in an aft cabin.

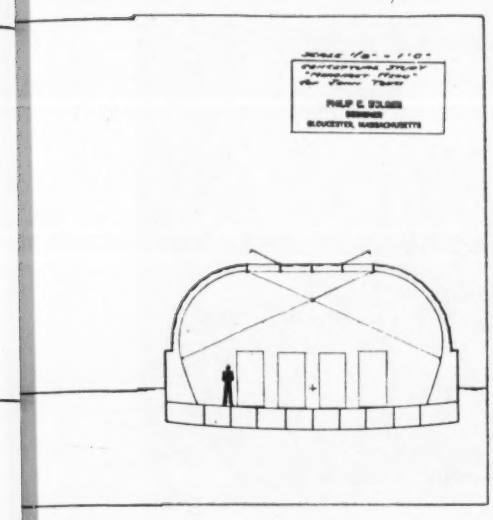


*Fig. 2*

*Bolger's design for the* Margaret Mead *includes fore and aft centerboards, water ballast, and two pusher-boats as engine power for calms and harbor maneuvering. The construction is steel, shaped for minimum assembly cost.*

## *Greenhouse Layout*

The two drawings show the longitudinally arranged solar aquaculture facility. The tree propagation units are not illustrated but are depicted in Tom Parker's drawings. With hanging flowers and food crops, the interior of the greenhouse should be a pleasing place to work. The roof line will give one a feeling of being in a moving, light-filled vault.

The original *Margaret Mead* concept articulated by Phil Bolger is being critiqued at present by a naval architect, several marine engineers, and a few old sea hands. Their concerns and modifications are being answered or incorporated into the design.

Weighing the information coming in, I am becoming increasingly aware of the complexities of the design process and the degree to which the ocean ark involves innovation. I have learned that a ship can't be designed by a committee or by consensus. It takes the private vision of an individual like Phil Bolger coupled to a team that fills the various technological sub-niches to complete the design process and explore uncharted areas. At this stage I see myself as a sort of conductor of an orchestra in early rehearsal of a new piece. I find myself saying the equivalent of, "Where the hell is the man with the tuba? Doesn't he know he is on next?" But no one ever said it would be easy.

## *The Company*

Ocean Arks, Inc., is a corporation that I have established to develop ocean arks and floating farms commercially. Jan Adkins, the marine writer and illustrator, conceived of the sea turtle as the company's symbol and designed the logo for it. The sea turtle is a fitting creature to represent our ideas, and I hope the realization of the *Margaret Mead* enhances their chances of survival. Sea turtles are long-distance ocean travellers with powerful ties to the land. They lay their eggs on tropical beaches where the young are born. Their future is being threatened as their eggs and flesh are sought by poachers on their nesting grounds. There is an affinity between ocean arks and sea turtles.

The corporation board is made up of people experienced in finance, international development, applied ecology, communication, and marine affairs. We expect seed capital for the *Margaret Mead* to come from experienced investors aware of the risks of the venture. At some point in the future I would like the company to be in a position to make stock available to the public. From early soundings I have come to realize that there are many people who normally don't invest in corporations because they cannot find companies that reflect their values. As harbingers of a solar era with an important economic and ecological role to play, ocean arks might well attract support from such people.

The success of the *Margaret Mead* will determine the long-range planning of the company to a large extent. The first ocean ark will be an experiment. If she is a technological success and markets are developed and financial viability indicated, I foresee that there will be more like her. Perhaps, for the price of a fair-sized mid-western farm, an ocean ark could be built and sold or leased to an ocean farmer. Second generation vessels might also supply the floating farms along the coasts that I spoke of earlier. Eventually we will look to ocean arks that carry cargo and passengers on scheduled routes. Perhaps one day there will be sailing passenger vessels with market gardens and seafood crops grown on board for the travellers.

For the time being there is a lot to do. The design needs refining. Then we need to embark on the engineering and building of the *Margaret Mead*. Then there will be a period of sea trials and testing and developing on-board culture techniques.

I hope this sailing ship will be a fitting tribute to the memory of a great human being. ■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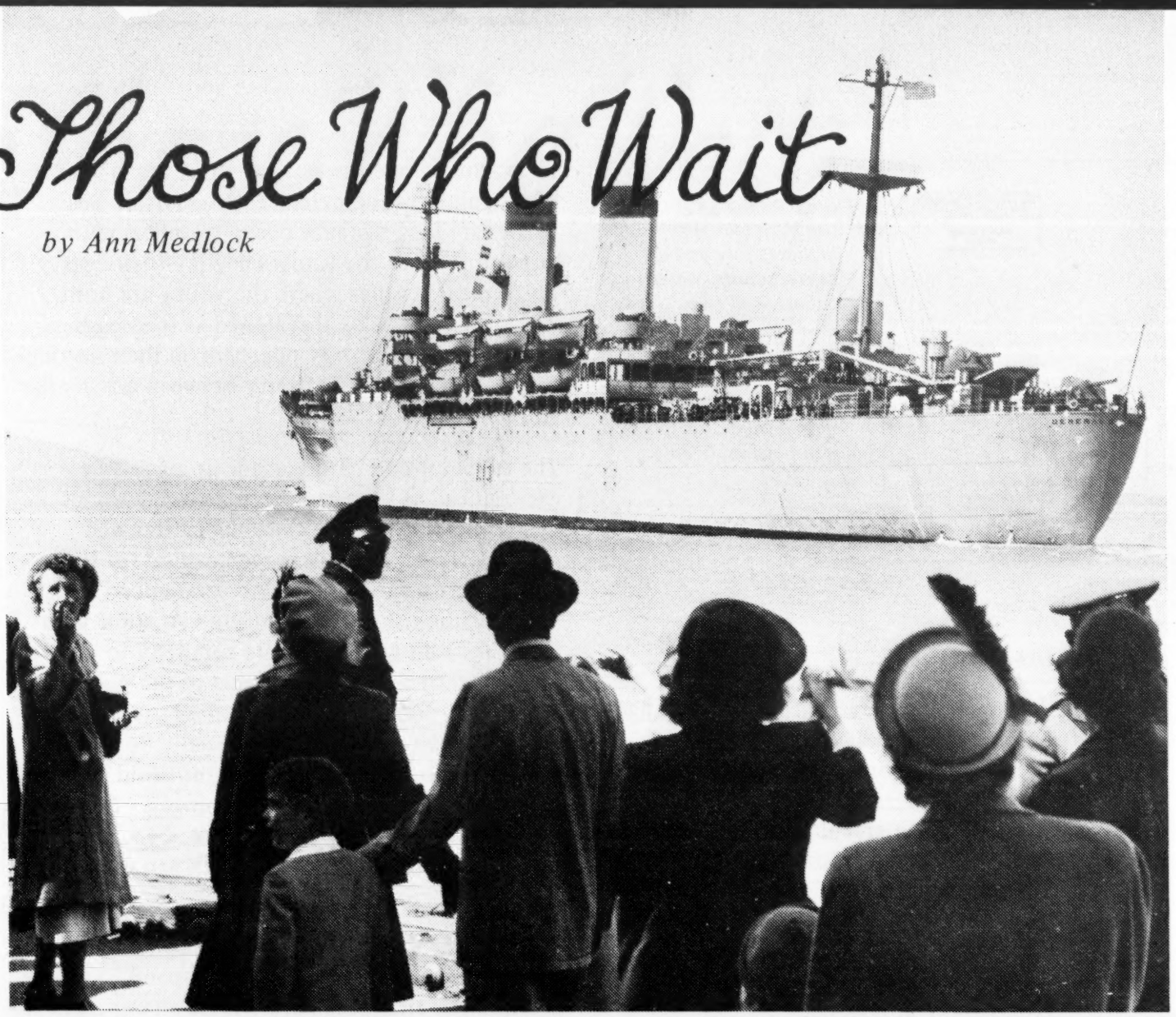
# Those Who Wait

*by Ann Medlock*



I DO NOT KNOW THE YEAR, but it was a time when the war was not going well. In the newsreels, in the papers, there were stories of defeat, of death marches, and of sinking ships.

My father's ship had burned at Pearl Harbor, one of the ones billowing black smoke in all the films as President Roosevelt's voice declared war on the Japanese.

He had been on shore leave when it happened, home with us on Coronado, an island in San Diego harbor that was half naval air base, half charming civilian town filled with Navy families. We had not seen him since voices on the radio had ordered all military personnel to report immediately to their ships and bases. Buses drove through San Diego's streets, loudspeakers blaring, stopping at corners to pick up every uniformed man in that town filled with uniforms. Reassigned to another ship, he had hurried away to Pearl, where the ships were burning, where the Japanese might be landing troops, where we knew that Navy friends had been killed in their backyards and in their cars by strafing planes.

San Diego harbor, normally filled with great warships, had emptied out, the carriers, battleships, cruisers, and destroyers steaming out past Point Loma and into the Pacific leaving the harbor bereft, the city unguarded, vulnerable.

My mother, my baby brother, and I sat in our green stucco cottage with the drapes drawn over closed blinds and a blanket shielding one small lamp. There must be no light to guide enemy pilots to the base, to us, sitting stunned in the closest mainland town to Hawaii.

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*FOR MANY INLAND AMERICANS, the war in the Pacific was their first introduction to the reality of oceans. Ann Medlock's family had lived with the oceans before World War II because her father was a career naval officer. She grew up on Navy bases all over and now lives in New York City. She's a publicist whose clients include entertainers, businesses and a school system. She got into publicity work via working for the Democratic National Committee in 1964. ("I was the one who went around taking down the pictures of Jack Kennedy because everyone else was crying too much to do it.") She is now having things published under her own name for the first time after years of having articles she ghost wrote for clients appear in everything from the New York* Times *to the Picayune* Courier. *Stewart Brand noticed her writing in an excellent article in* New Age Journal, *asked her for more and got this.*

*The photo above of the* General G. M. Randall, *U.S. Army transport ship, leaving San Francisco, was taken for the San Francisco* Chronicle *by Joe Rosenthal, the man who took the picture of the flag raising at Iwo Jima. It was actually taken a few years after the war, because during the war photos of troop ships weren't allowed.* —*Anne Herbert*

*Air crewmen on alert in Ready-room, 5 Nov. '44.*

In the months after that, the mailman had become the most important human on Coronado Island. Every day my mother had a letter ready for him to take, a letter that smelled always of the sweet peas she grew, picking each day just one to fold into the pages and send into the war, to mythical Navy-made places full of numbers and of words like ComDesWesPacFor. Most days the letters the mailman gave her in return were things she shuffled quickly through and dropped unopened on a chair or the kitchen counter. Then there would be a day when he came down the walk beaming, and she would run into the house with a bundle of V-mails, untying them and sorting them out on the floor to read in order, one for each day that had passed since the last date in the last bundle that had come.

Drawers full of V-mails later, one had come that said, "I think I'll be shaving my mustache before Halloween," and "Why don't you and the kids go up to the Clarks' for your birthday?" Since she hated face whiskers and he always grew them at sea and the Clarks lived in San Francisco and her birthday was October 27, she knew what to do. The *Hampton* was coming home.

In the next few weeks, I worried about my mother. Posters everywhere warned that a slip of the lip could sink a ship, and there she was, not saying anything really, but laughing too much and arranging for a friend to harvest our victory garden, buying makeup and perfume that she didn't open and making a lot of new clothes that she didn't wear. She kept standing in lines for stockings and had four pairs in packages on her dresser, but she kept painting on leg makeup. She made an awful suit with big shoulders and a short skirt that she told me she would need for going out in San Francisco, which was chic, almost Eastern. Then she made a red silk blouse with no back and a black satin skirt that she didn't sew up one side, and she didn't tell me what that was for.

She was definitely a security risk. I tried to make up for this by becoming ever more solemn as I made my red wagon rounds of the neighborhood, collecting coffee cans full of used cooking grease, clattering piles of flattened tin cans and stacks of newspapers that left my dresses grey with ink. All of it was tugged dutifully, ritually to the nearest gas station. There I placed my offerings on the piles of precious junk that would be scooped up by trucks from the base for recycling into explosives and tank treads.

Saturdays there was the 9¢ matinee, hours of Abbott and Costello, Flash Gordon, John Wayne, and the newsreels. Sitting over a lemon phosphate at the drugstore after the show, I silently ran and re-ran the images of the ships, ships with guns erupting fire clouds, ships lowering away lifeboats after being torpedoed, ships slipping under the sea. I would not play in that sea, would not even walk on our beach, knowing that the water was filled with drowned men who might be my father. On the days I deemed war efforts worthy, he would be safe. I knew he was not in trouble the week that I hauled two threadbare tires to the service station heap, and one week when collections were slow, I carried over my new Magicskin doll, just to be sure. If I got the yellow dye squeezed evenly through the disgusting sack of white oleomargerine, he was safe for at least a morning; running home under the oleanders and the pepper trees while the air-raid sirens screamed meant that no planes were diving on his ship. I stopped speaking to the Chinese kids who lived two houses away because they might really be Japanese. I couldn't be too careful.

I DON'T KNOW HOW MANY wartime families had censor-beating codes, but by the end of October in that long-ago year, San Francisco was full of *Hampton* wives and children. They had all beaten gas rationing or impossible crowds at train and bus stations to get there – civilians had no priority on travel space, the seats going first to the droves of military travellers.

We had been lucky. My brother, Rob, had completely charmed a teen-aged sailor from Ohio who was waiting near us in the mob jamming Union Station. Rob had been wearing the boy's hat and

*Dazzle camouflaged carriers in Ulithi Anchorage*

getting romper fuzz all over his uniform for hours before the train going north was announced. The sailor headed off through the crowd, carrying Rob on his shoulder. We had tried to keep up but had gotten caught in the press of bodies. My mother was calling out to the boy to stop and give Rob back, but he was already on the train steps, talking to the conductor and pointing to us. The conductor waved us through the crowd, to coach seats with Rob's friend. "I told them he had to let my wife and daughter aboard, too," he said with a pimply grin.

In San Francisco, Rob and I stayed at the Clarks' where there were two bad-tempered boys who were less than pleased to see us, and my parents had this terrific room at the Mark Hopkins where we only got to come in the afternoons. There are family pictures of outings in the city, and I am stung now by how young they were, how defenseless, these people who were my parents. How could this be the giant whose dark voice so startled me, whose severity intimidated me, this young man in a gold-buttoned suit, smiling tentatively? And my mother. This woman in the pictures is not the woman I carry in my mind. I try to meld the images of the girl in the snapshots and the mother in my memory, and I am filled with her fear and with her courage.

There was a terrific picnic at an officers' club where my father and some of his friends presented me with a bowl of pollywogs they said had gotten shell-shocked aboard the *Hampton* and appointed me to nurse them to a peaceful recuperation ashore. But mostly it wasn't much fun, each day becoming less so as the badly-hit ship came closer to leaving drydock and my parents became sadder, more distracted.

He had not talked about it, but I knew from eavesdropping at the club that a kamikaze had hit the bridge, and shells had torn open the forward bulkheads and some of his friends had died.

The part of the story that had frightened me the most was the long, slow towing of the wounded ship across the Pacific. I knew from the matinees how dangerous such a voyage was, and I wondered how the enemy submarine commanders had missed such an opportunity to take advantage of helpless Yanks.

EACH DAY THE TWO OF THEM became quieter until we were all standing on a dock beside the re-floated ship and they were saying nothing at all. We had not seen the *Hampton* in its agony, but now it loomed tall above us, a great, grey wall held taut to the pier with massive ropes, full of noise and movement and power, ready to go once more in harm's way. Dozens of families stood in its shadow, each one a tight cluster of colors around a single, dark figure. The adults did not look at the ship and no one stood near the gangplank, where officers and men whose families were not there hurried aboard.

On the other side of the narrow dock, another ship loomed, its gangway already pulled in, its decks lined with Marines in full battle dress, silently watching the scene below. No one was there to see them away. They had made their goodbyes in Ohio or Georgia or New Mexico and now only stood and witnessed the undoing of this last tie to home, lived out these last moments of safety.

No sunlight from the fine blue sky directly above us fell into the corridor between the ships, and the wind from the sea channelled into the narrow space with a shiver. The *Hampton* began making strange noises, and men were breaking away from embraces and outstretched arms to move up the gangway.

"You be good now, you hear? Take good care of your Mama and Rob." He was holding too tight and his shoulder boards scratched my face, but I held on still tighter because the ship was burning and men were jumping from its decks into the sea. I could see it tilting crazily in the water high above me and my beautiful father spiraling down in great, slow circles toward the place where I waited under the sea. I must swim to him and take his drifting

*Pearl Harbor*
*7 Dec. 41*

hands and pull him up to the air that he must have to live, but he did not understand and pulled himself away. My mother moved into his side, her lavender dress soft against his uniform and then he was climbing up to the ship.

I could not find him among the black and white forms that banded the decks and the bridge, but I could see that her eyes were fixed on a place directly above us on the ship's superstructure. She waved and I wondered how she could think that one of those forms was the right one and the others were not. But one of them waved back in the way my father did, so I showed Rob and we waggled our arms and shouted up to him.

There were no men on the dock now and many of the women were walking quickly away, leading or carrying their children back through the gates where the Shore Patrol stood watch.

The gangway was drawn aboard, the thick hemp hawsers with their metal rat guards thrown down, and the great ship was freed. It throbbed slowly, awesomely away from the dock and my mother moved with it as it slipped along the length of the pier, her eyes holding to the figure on the bridge while she threaded her way through the women and children who remained.

I tried to get Rob to walk to the end of the dock where she had come to stand, but he cried to be carried. Finally the Gunnery Officer's wife scooped him up and went with us to the dock's end. My mother's arm was still in the air and, farther and farther away in the harbor, the man who waved like my father still moved his hand back and forth slowly over his head.

"BASTARDS!" said the Gunnery Officer's wife. Startled, I followed her line of sight to the troop ship, where Marines were laughing and shouting, some of them hanging over the rails to attract attention.

"Don't worry honey, you'll find another one!"

"How about me, cutie? I'd jump ship for you."

"Hey, there's always the 4-Fs – don't cry too long, babe."

The women were glaring at them or pretending not to hear or leaving angrily. Rob thought they were funny and gurgled happily at them. My mother still had not turned away from the *Hampton*, though by now it looked like one of the models on my father's desk.

"Mama, I can't see him anymore."

She looked at me, startled, I think, that I was there.

"But he may be able to see us." She turned quickly back to the *Hampton*, holding it firm with her eyes, with, I know now, the intensity of her need to keep him with her. Unstoppable in its purpose, in the gravity of its mission, the *Hampton* carried him away. I thought she did not hear the Marines and then I realized that they had stopped.

Their ship had begun to move too, easing away from the dock to take its place in the convoy that was moving under the Golden Gate, out of the sheltering arms of the California hills that enclosed the harbor, into the Pacific and the war. There was no sound at all.

Then a voice called out softly, "Goodbye dear," and another, "Goodbye, take care." Men were calling down from all over the ship, and I could not understand who they thought we were.

"Don't worry darlin', I'll be OK."

"Think of me."

"I love you."

"Goodbye."

"Goodbye."

My mother turned away from the toy *Hampton* to smile, cry, and nod her head in answer to the Marines. And we stayed there, still waving, until their ship, too, had disappeared into the afternoon sunlight that could now flood the openness of the empty dock. ■

# ANTI SUBMARINE WARFARE

*by Robert C. Aldridge*

*We figured that if you are going to have an oceans issue, then there probably ought to be something on what the Navy is up to. Right? So we called a friend in the Navy Department and asked whether he knew someone who'd be willing to jot down some looks and thoughts on impending naval activities in the 1980s. Sure, no sweat. So they wrote up two pieces, one on strategy and another on the Navy's interface problems with the Coast Guard. We were in the swim, until the Pentagon censored both pieces. We never saw them. Oh heck! Then we saw a short piece in the New York* Times *on Trident's offensive capabilities and its extraordinary attendant sub-detection network. It was by Robert C. Aldridge. We found him and he sent on this article, which appeared in* The Nation *for June 11, 1977, here recast and updated.*

*Robert Aldridge is an aerospace engineer who helped develop five generations of submarine-launched strategic missiles. Besides working on underwater launch technology he held a key position in designing MIRVs and MARVs. It was on the Trident program that he saw the shift toward first strike that caused him to resign. Now a critic of the arms race, he has written for numerous publications and delivered papers at several international symposiums. He wrote "The Counterforce Syndrome" and "First Strike."*

*—Eds.*

AN UNANSWERABLE NUCLEAR FIRST strike is impossible, claim our leaders and military experts, as they work industriously to make it possible. Particularly, they say, all those missile-launching submarines could never be pinpointed and destroyed. Even President Carter has re-echoed the worn tune of the Nixon/Ford administration: "There would be no possibility under the sun that a first strike capability could be adequate. . . . There is no way to prevent a massive retaliatory strike because for all practical purposes atomic submarines are invulnerable." Maybe they were when Carter was a submariner, but they will soon be sitting ducks.

# PENTAGON OFFENSIVE ?

Why else is anti-submarine warfare attracting so much attention from the military? The Navy spends $6.5 billion on Anti-Submarine Warfare (ASW) each year. In addition to straightforward military contracts, unknown amounts are buried in the budgets of such agencies as the Energy Research and Development Administration, the National Aeronautics and Space Administration and the National Science Foundation. ASW is no longer just defense against hostile submarines. It is an aggressive activity.

To put the ASW picture in focus one must count up how many Soviet submarines would have to be destroyed simultaneously to assure that a nuclear attack could not be answered. As of mid-1978 the Russians had approximately sixty nuclear-powered ballistic missile submarines. SALT-2 restricts only missiles and bombers, not submarines as such. Nevertheless, let us say that by 1982 the Soviets could have seventy-five nuclear-propelled strategic submarines capable of running deep for extended periods and of retaliating against the United States with hydrogen warheads. Even if that number were increased three- or four-fold it would not be beyond the tracking capabilities we are now developing. To make the job easier, the Pentagon estimates that only 15 percent of Russia's submarine fleet is away from port at any one time. Most of them could be destroyed in their pens.

ASW is basically composed of weapons, platforms and sensors. Today's weapons – torpedoes, depth charges, missiles and mines – are very good at destroying atomic submarines. Torpedoes can be launched from submarines, ships or aircraft; nuclear depth bombs can be delivered by missiles launched from submarines and surface ships, or dropped from aircraft. Smart mines for deep and shallow water that will only attack hostile submarines can be placed by airplanes, ships or attack subs. All these weapons are being constantly updated.

Platforms that carry ASW weapons and sensors are also being steadily improved. U.S. hunter-killer attack submarines now number somewhat more than sixty and their number is climbing toward the Navy's goal of ninety. Newest of these are the Los Angeles class, of which thirty-nine will have been ordered by 1981. ASW aircraft vary from land-based P-3 Orions and the carrier-based S-3A Viking patrol planes to helicopters operating off frigates, destroyers, cruisers and aircraft carriers. All these systems are highly automated by computer technology. Sensors, navigation instruments, flight controls and weapons delivery systems are digitally interconnected. Computers can fly the aircraft, detect and identify a hostile submarine, select the appropriate weapon, and then photograph the results after that weapon is fired. ASW patrol planes and helicopters envisioned for the future will be even more sophisticated.

The Navy's ten-year shipbuilding plan includes new frigates, destroyers and cruisers, each of which will accommodate two helicopters. A new series of small aircraft carriers called vertical support ships will be built around the requirements of V/STOL (vertical/short takeoff and land) aircraft. For the late 1980s naval planners are looking toward even more exotic ships, ones that can skim the water on hydrofoils and air bubbles to race after submarines at 50 to 80 miles per hour.

But despite all this attention to weapons and platforms, sensors are the backbone of the Navy's anti-submarine warfare program. Their use is divided between local and area surveillance. Local, often called escort, surveillance is intended ostensibly to protect convoys and task forces from enemy hunter-killer submarines. It scans a small piece of ocean, approximately 60 miles around the ships. The type of sensors used are designed to spot any submarine within that locality and determine whether it is "theirs" or "ours." Sensors are now so precise that they can tell the class of submarine.

Area surveillance, on the other hand, is ocean-wide. Its purpose is to track all submarines and plot their location within 60 miles. It is easy to see how the two types of surveillance would work hand in glove if a nation were considering the simultaneous destruction of another country's subsurface fleet.

Sensors are the eyes and ears of anti-submarine warfare. Sound has always been the basic means of underseas detection because radio and other types of electromagnetic waves will not pass through water. Sound travels for thousands of miles in the sea, but bends as it does so, much as light is refracted by a prism. Sound also ricochets off the ocean's surface and bottom, scattering into multiple paths and zigzag patterns. The warmer layers of water near the surface (called thermal layers) also reflect sounds back into the depths. To add to this complexity, the ocean is anything but a quiet place; sea creatures, ships, storms and other phenomena all produce a cacophony.

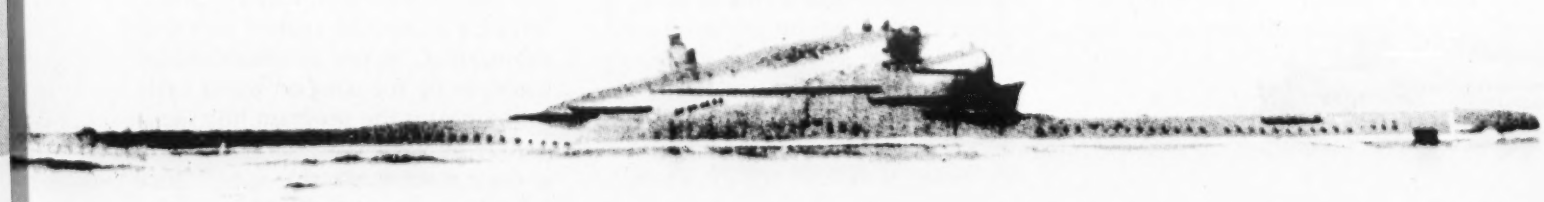
The device used for sonic sensing is called sonar. One type is passive; it only listens. Therefore it does not reveal its position and can remain undetected for a long time. Active sonars bounce their own sounds off submarines and other objects; they can be heard and are not suited to clandestine activities.

Hull-mounted sonars are the oldest means of local surveillance. They are huge devices, mounted below the waterline of ships and in the bows of submarines and with both active and passive modes. The Navy has also developed arrays of sensors that are towed behind ships to improve their ability to locate and identify submarines, but these arrays are awkward to handle. And however much this may be improved, hull-mounted sonars and towed arrays will be plagued by thermal layers. Modern nuclear-powered submarines travel deep and if their noises are bounced back down they can operate unheard by surface craft. To overcome that deficiency the Navy has developed a variable depth sonar which is towed by a 600-foot cable and stabilized by a gyro as it "flies" below the thermal layers. The latest types function with negligible drag at the highest speed of today's surface ships.

Sonobuoys are the final type of sonar used to pinpoint submarines. They are hydrophones dropped into the water by patrol planes or helicopters and come in a variety of types:

Below: Soviet "WhiskyLong-Bin" class cruise missile submarine, a very noisy boat. From Jane's **Fighting Ships**, 74-75.

Opposite: U.S. Navy sonobuoy in tow by a SH3H helicopter. Photo courtesy of U.S. Naval Institute.



directional and omnidirectional, passive and active, short-range and long-range. Passive sonobuoy canisters are approximately 5 inches in diameter and a yard long, but a new dwarf size can be put three in a single canister. Active sonobuoys are larger and are used to prepare for attack after a passive signal is received. The sonobuoy antenna remains above the surface to transmit acoustic data to aircraft, while a probe is lowered as deep as 800 feet to get below the thermal layers.

Before concluding the discussion of the role assigned to local sensors in eliminating a hostile fleet of subs I should mention several nonacoustic devices. Besides the usual radar that is quick to find an antenna above the water, and passive radiation receivers which pick up signals from other vessels, ASW planes use infrared sensors to measure ocean surface temperature differences in the order of hundredths of a degree. Any such local variation that does not conform to the general area pattern could be caused by a sub churning the thermal layers. ASW airplanes and helicopters are also equipped with magnetic anomaly detectors that will spot any variance in the earth's magnetic field caused by the steel hull of a submarine. Scripps Institute of Oceanography has made it possible to map the total magnetic field at sea. Those maps are stored digitally in the aircraft's computer, to be compared with what the detector senses. Anomalies are quickly noted and compared with the known magnetic signatures of various submarines, also stored in the computer's memory. The submarine can thus be classified friend or foe. Magnetic anomaly detectors have a short range, but they are remarkably effective in guiding the aircraft into position for a kill.

All of the foregoing sensor systems are integrated through a network of ground-based, shipboard and airborne computers. Like magnetic anomalies, acoustic signals and radar echoes can also be compared with known signatures of friendly and hostile subs. Reference systems between various sensors and arrays accurately locate submarines; television-type screens display the information, and data links interconnect activities among aircraft, ships and land stations. The automation is profound.

To put ASW aircraft, ships and submarines within 60 miles of every Soviet sub, so that all can be wiped out at one time, is another matter. That is the function of area surveillance. The heart of the Navy's ocean-wide sensing system is the Sound Surveillance System (SOSUS), on which more than $1 billion has been spent over the past twenty years, and which is continuously updated. The ultimate objective, claims the Navy, is to integrate all the undersea sensors into a fully coordinated and centrally operated network.

SOSUS is composed of fixed, passive hydrophones placed on the continental shelves throughout the oceans of the world. The sonar chain between Greenland and Scotland spots every Russian submarine entering the North Atlantic from the Arctic Ocean. The Azores Fixed Acoustic Range monitors submarine traffic through the Strait of Gibraltar. These are two of many installations throughout the world which, when conditions are favorable, can detect a nuclear-powered sub anywhere in the ocean. SOSUS can locate that submarine within a 60-mile radius and interact with ASW patrol aircraft and escort surveillance ships. But it still has limitations and the Navy is developing two augmenting systems: towed arrays and moored arrays. These, as well as modernizations of SOSUS, will employ a new sonar designed especially to detect cavitation noises generated by the turbulent flow of water around fast submarines (as opposed to hearing engine noises and other sounds from within the ships).

Area surveillance arrays now being pulled back and forth across the oceans will soon be replaced by much more sensitive arrays. They will relay acoustic data via satellite for processing and analysis by shore stations, and will provide a geographic flexibility that SOSUS lacks.

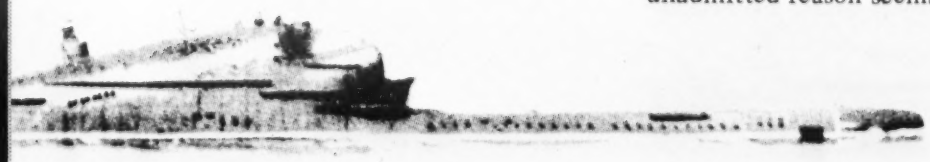
The other SOSUS supplement, moored arrays, now called rapidly deployable surveillance systems, are said by the Navy to provide quick reaction surveillance of crisis areas. The buoys can be readily placed by aircraft, surface ships or submarines in a zone of particular interest. Moored arrays were scheduled to go into full-scale development in 1977 but the Navy abruptly revised that decision and delayed that step. The unadmitted reason seems to be a breakthrough in sonar technology by the Defense Advanced Research Projects Agency (DARPA).

DARPA was formed after Sputnik to outguess the Soviets and prevent future surprises. It is conducting far-reaching studies into anti-submarine warfare that reveal the Pentagon's interest in a knockout first strike. DARPA's experimenters have found that, contrary to previous assumptions, the path of underwater sound can be predicted. Although sound conditions beneath the sea are forever changing, they do remain fixed for brief periods, and by working in a series of very short time slices, the ocean can be made a much more tractable medium than had been thought.

DARPA's work with sound in time frames seems related to the Navy's Long Range Propagation Project. In 1973, the Navy used a towed array to take measurements that a computer program could employ to predict ambient noise. It seems more than coincidence that in mid-1974 a representative from Bell Laboratories to the Eighth International Acoustics Congress in London read a paper which described a computer simulation that predicts sonar patterns by combining known oceanographic information with current sea state data. The prediction, when compared with actual sonar signals, allows background noises to be canceled out. Remaining sounds are then classified to isolate hostile submarines.

Thermal layers, ocean floor contours and surface choppiness all affect the time it takes a sound to travel from source to sensor. Bottom contours and coastlines are easy to plug into the computer model because they are known and remain relatively constant. Sea state samples must be obtained by satellite and introduced at half-mile intervals. The resulting simulation provides a current picture of conditions for sound propagation over a 10,000-mile range after only two minutes of computer operation. It is estimated that, at that distance, the Bell simulation would place a submarine within 10 miles. Hitting it would then be easy.

Early in 1975 DARPA announced a new program, Project Seaguard, which concentrates on ocean-wide undersea detection. Seaguard combines the peak performance of acoustic arrays with a network of shore processing stations to achieve maximum detection, locating and tracking accuracies against very quiet submarines. Speed increases turbulence, so by focusing on water cavitation noises the program hits the speedy nuclear-powered submarines in their most vulnerable spot. Since DARPA seems to be making good



progress toward predictions that will cancel out unwanted noise and locate submarines within very small areas, the number of aircraft and sensors needed for "routine follow-up operations" can be reduced. DARPA's new system is scheduled to become operational by 1982. That is undoubtedly why concept studies of moored arrays have been prolonged.

Predicting and canceling out ambient noise will be a quantum jump in sonar technology. Project Seaguard will arrange combinations of mobile and fixed arrays so they can triangulate on targets and analyze signals in real time. That means data must be received and processed almost instantly and synchronized to a common time base, a computer capacity far exceeding conventional units. Therefore, DARPA has developed the Illiac-IV, one of the world's most powerful computers. It operates as if many identical computers were working in parallel, an arrangment that vastly increases the volume of work that can be put through in a given time.

Dr. George Heilmeier, former director of DARPA, explained that the goal of Project Seaguard is a surveillance system that can provide appropriate commanders with timely and accurate information on the operation, location, identity and specific movements of hostile submarines. He states that "if a majority of our submarines were to be successfully kept under surveillance at all times, the vulnerability to pre-emptive attack would significantly reduce the deterrent effectiveness of our fleet ballistic missile forces." That logic obviously applies in reverse to the Soviets. If we could track *all* of their subs *all* the time, they would cease to be a deterrent.

A new space program has been initiated to collect the meteorological data needed for computer simulation. The Seasat-A ocean dynamics satellite was launched in May 1978 but malfunctioned after a few months. It used sensors that have already been developed. The data collected by each satellite in one day will equal 20,000 weather reports from ships around the globe.

Seasat's sensing capabilities include various modes of active radar, passive microwave detectors, and infrared sensors. Containing more sensors than any other spacecraft yet built, it can provide day and night observations in almost any weather. Seasat will measure wind velocities and direction; height, shape, and length of waves; precise sea surface topography due to currents, tides, and storms; it will note gravity-related depressions in the ocean's surface and monitor current patterns, surface temperatures and ice packs. All of this information is needed to predict sound propagation patterns.

A planned constellation of six operational satellites will be put in polar orbit for use between 1985 and the end of the century. Using the Navstar global positioning system to establish their readings within 30 feet, those six satellites will update all of the aforementioned meteorological data over 95 percent of the earth's surface every six hours. That seems to be an adequate time slice for timely predictions.

Optical Ranging, Identification and Communication System (ORICS) is a local ASW application that eventually spread to area laser sensing. Mounted in a helicopter and operating in the blue-green wavelength of the visible spectrum (the tuning for maximum penetration of sea water), this pulsing chemical laser has located submarines in tests conducted off the Florida Keys. Also being developed as a communication system between aircraft and friendly submarines, ORICS will have a fleet ASW application in a few years.

Sensor development has taken a sinister leap in the last decade. Originally touched off by the invention of the computer and receiving their test on the automated battlefields of Vietnam, sensors are now being refined for such exotic applications as homing maneuvering warheads and cruise missiles. ASW has also reaped its share of this technology. What I have presented here is merely a glossing over of a highly technical and complex picture, but even a conservative evaluation of this information throws doubt on the elusiveness of submarines. The invulnerability argument can no longer mask the fact that U.S. weapons programs are moving us rapidly toward a disarming first strike capability with nuclear weapons.

A January 1979 report prepared by the Congressional Research Service of the Library of Congress states:

> . . . If the United States achieves a disarming first strike capability against Soviet [intercontinental ballistic missiles], and also develops an ASW capability that together with attacks on naval facilities could practically negate the Soviet [ballistic missile submarine] force, then the strategic balance as it has come to be broadly defined and accepted would no longer be stable . . . current trends in U.S. ASW programs should fall under close scrutiny. . . .

*It is ironic that a U.S. disarming first strike capability, regardless of intentions, could motivate the U.S.S.R. to attack first. An unstable condition could come about during some future international crisis when Soviet leaders might feel tempted to launch their weapons before they lose them. Thus could be the beginning of World War III.*

As for ASW, according to the evidence now available, the Russians are concentrating on the surveillance of their home waters and frequently-used sea lanes, attempting as yet no global policing of the oceans. But everything said above is drawn from open sources; the Russians know all about it. So before long they will move to match us, sonobuoy for sonobuoy and computer for computer – and the doctrine of mutual deterrence will begin to weaken – until one day comes the snapping point. ■

# Wooden Boats

*by Jon Wilson*

In a world overrun with the products of technological revolutions, you can't help but wonder, occasionally, who cares about wooden boats, and why. There are plastics and polymers enough to turn out production boats for the next decade, and too few of us to care beyond that. The designs for Today are roomy, racy, and revolting. But they're also popular. So, I'm awed by the growth of *WoodenBoat* magazine. It seems impossible and sometimes dreamlike. There are days when I expect to walk in and find that the world has turned away completely from wooden boats, exhausted by the prospects of the love and care needed.

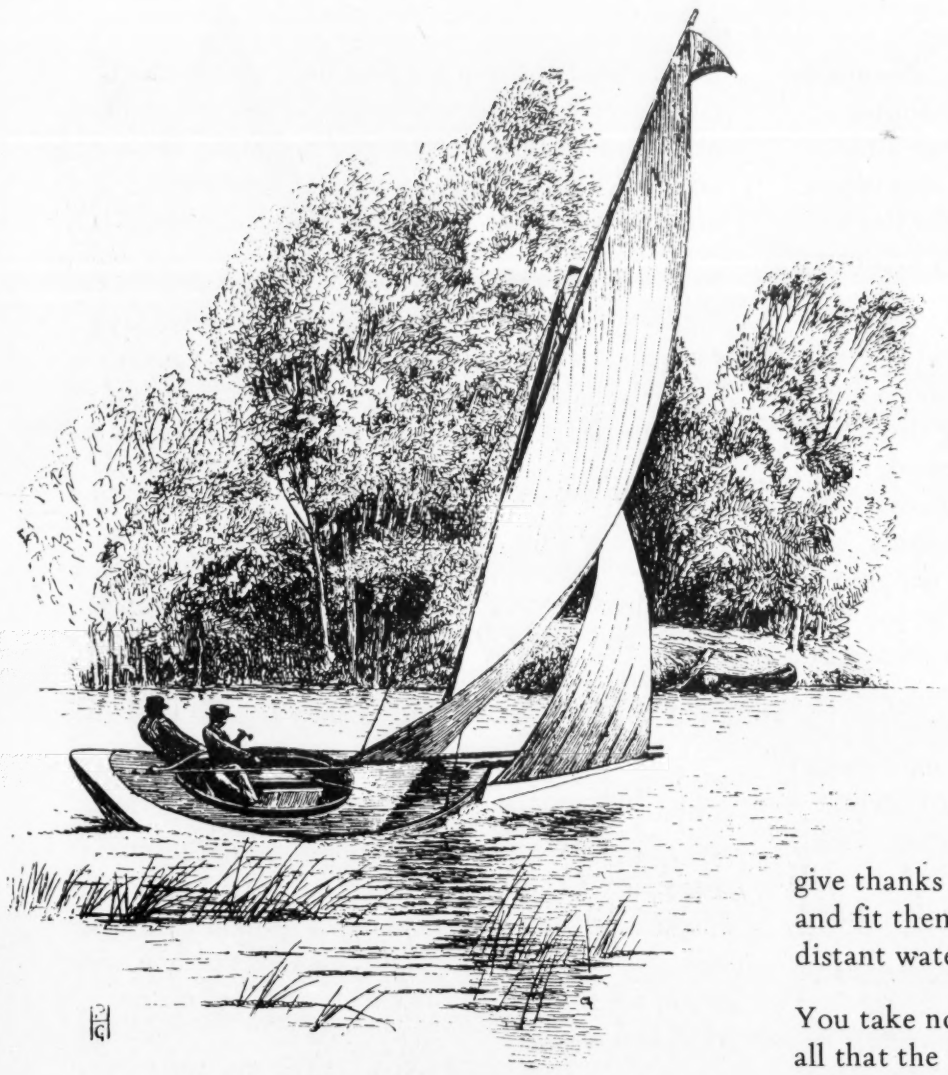
I've thought about it hundreds of times. Engaged in a conversation about what I do for a living, I'm more often explaining that there *are* people who care about wood, and that yes, fiberglass does have its place. But it's always such a dilemma. For most people, the point is simply to be on the water – to relax, to show off, to feel salty. The vessel that carries out those dreams can be made of most anything. So, what's the difference?

The plastic boat types will tell you the difference is in hours of work. The wooden boat types will tell you it's in expedient shapes and structures, odious, translucent hulls, and shoddy fittings. I don't know what to tell you.

I don't hate fiberglass, ferrocement, or steel boats. But I don't like them, either. More than that, I don't *love* them. Indeed, I feel somewhat as I do about mannequins – they're reminders of the real thing, and no more. And how much can you love a mannequin? Oh sure, I could keep one around the house. With the shades drawn we could dance and sing, and spend hours in pleasant chatter. It would ask little more of me than an occasional dusting, and provide little more than ornamentation and an empty reflection of my state of mind. But the real thing – ah! We could walk and talk, sing and dance, and do all the things that companions do. Even the silences would be full. There would be high and low moments, but their very occurrence would breathe life into us. *We* would be the ornaments of our own creation.

*Jonathan Wilson is the founder/editor of* WoodenBoat *magazine,* the best *boating magazine published in this country today. Like the founder of anything, he is a man of vision, because surely a person must have vision to invest one's last penny in a magazine initially published out of the back of a truck – a magazine declared by most sages to be dead before it started and doomed to be shredded for mattress stuffing soon after, since "wooden boats are obsolete and nobody cares anymore." To the contrary,* WoodenBoat *caught on, and its circulation has grown steadily, enough so that the magazine employs a sizeable workforce, advertisers have taken notice, and the wooden boat revival has taken on new, and serious, meaning.* WoodenBoat *is our kind of magazine; it could be yours.*

*–Eds.*



Wooden boats are the real thing for me. Plastic boats are but reminders of what they could be. Not that there haven't been some wonderfully faithful replicas of fine classics in glass, nor that a great many people can scarcely tell the difference. Sometimes, in the distance, I can hardly see it myself. But those are rare boats. Most of them make no pretense at looking like their forebears, and it shows. So much for aesthetics.

The fact is, wooden boats are made of the same stuff that we are, and I'm as drawn to them as I am to beautiful human beings. They ask for the same things – love, care, and attention, but I'm used to it, because so do my friends, and moreover, so do I. I may never escape from that.

It begins in the forest, where the cedar reaches, straight and tall, for the sky. And in the pasture, where the oak spreads magnificently over its roots. Reaching out and up, these great creatures invite us to transform them into new life. In the fall of the year, when the woods become drowsy, you can venture in and stand silently, looking for the perfect trees. One by one they make their presence known, and you mark them in your mind. On the right day you go in with axe and saw, cut them down and limb them up. In a harvest ritual you give thanks and a promise to shape them well, and fit them right, to live out their days on distant waters.

You take no more than you need, and leave there all that the forest floor can use – the cones for seeds, the greens for cover, and small branches for the nourishment of new birth. The rest will come out on the sledge with the logs – new fuel for the stove in the shop.

The spreading oak comes down step-by-step, for in its crooks and branches will be found the sweetly-curved timbers that make up the framework. From the long, straight butt will come her keel and floors, the backbone of a small boat built for swiftness and strength. When the fuelwood is gathered, naught will be left but the stump. Even the acorns are picked – to be sorted and cast in another field, where pasture oaks are scarce.

On the quiet evenings, while the sawyer plies his trade, the model on the mantel is smoothed and refined. A little less wood here for rowing or sculling, a little more wood there for stiffness in the gusts. A little more shape here so she'll lift to the seas, a little less there so she'll beach for a picnic. A thousand years of evolution have influenced her form, handed down from a time when boats were built by eye alone, and planks were shaped to suit the wood.

When the lumber arrives from the sawyer's mill, it's stacked in the shed to dry. A winter, a spring, and a summer will pass, sending curling draughts throughout the neat piles, gently drawing the moisture from the fibers. As fall begins again, the time has come to measure the model so carefully carved, and lay down the lines full size on

the floor. When they all work together, the molds are made, over which this handsome 20-footer will be built. She's a day boat, really, but a tarpaulin spread over her boom in the evening offers the coziest accommodation within, as she lies to a mooring, rocking her occupants gently to sleep on the floorboards beneath.

When the backbone is set up, the ribbands go on, hinting of the shape to come. The steambox is fired for cooking the frames – just long enough to be able to bend them completely around, if need be. The steambox is loaded and the frames bent in, a pair at a time, one side to the other, and fore and aft from amidships. With two people, and plenty of steam and plenty of clamps, the job will be done by mid-afternoon, the skeleton resting in place. While the new timbers cure to their shapes, the planking stock sawn so long ago will be sorted and planed – the thicker pieces for the hard turns where the shapes must be sculpted out of them, and the thinner ones for the flatter sections. One by one they are spiled and cut, fitted and fastened. Day by day the soul of the boat is further revealed. Inside and out she begins to take shape.

A gaff-headed sloop is a fine little craft. She'll climb to windward with spirit, and reach and run like a thoroughbred. Her gear is simple, her fittings minimal, she's underway in five minutes, and is utter simplicity to sail, with her self-tending jib.

As the days begin to grow longer, one anticipates the long summer afternoons, warm and breezy, with the water curling away from the quarters. Winter's mantle recedes as her decks go on and the spars are shaped. A friend sews a quiet cotton sail.

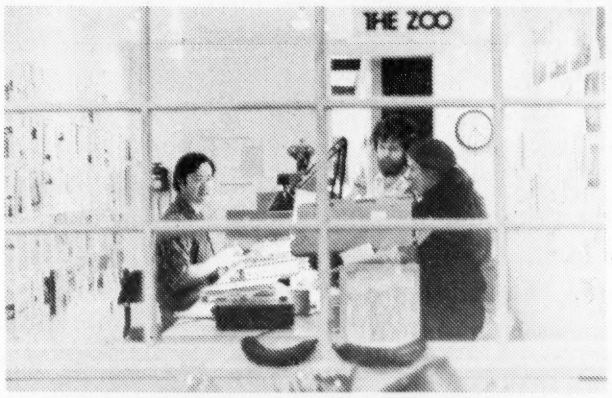
And then comes the day. The tide is right, the sloop is finished, her oars and sails ready. The little cove is quiet now, sheltered from the breeze that blows down the bay. She slides in with no effort, and floats on her lines like a sea-creature. With sails bent on, she ghosts out of the cove to catch the bay breeze, and as she fills away for the first time, she comes alive.

A boat like this is born to fly – she spends hours and hours attempting to take flight, her helmsman ever ready to accompany her. Her creation is her purpose fulfilled, but she strives now to go higher still. Left alone, she will sail herself, needing only gentle adjustment to the sheets as she plays on wind and wave.

She may be the closest one comes to creating another form of life, and the love invested in her creation and care will be returned a hundred times over. Asked to be the best she can be, she will be much more. Asked to be more, she will inevitably be less. On the breezy days, she'll fly over the waves, intent on her course, in charge of her crew – completely involved in the moment at hand. But on soft summer nights when the light breezes blow, she'll whisper her affections as she glides. You can listen in silence, as your heart whispers back, and two souls make way for the stars.

You can look at boats as you look at people, with the spirit of giving or the spirit of taking. The former fulfills itself, and the latter never does. But there must be something to love. In some boats you can see that they never even wanted to be built, and they're burdened with it. When they're built to express the hopes of many, they're born to try and fly higher. When built for the gain of a few, they're mutations from another world, no matter what the material.

Somehow, the soul of a boat is revealed more brilliantly through the caring hands of the craftsman in wood, and not through the spray guns of the instant boat builders. As one faces the choices, one has to decide. On the one hand is a being with soul, and on the other, a simple substitute. The second requires only our presence. The first requires our love and care. It will ever be thus with living things. ■


*Above and below, the folks at* WoodenBoat.

WoodenBoat *is an oasis in some pretty hard territory. Sincere people there work with dedication to put out issues they love. Not surprisingly, readers love them, too. You have to see the magazine to realize what a treasure it is. Get it from your newsstand, or:*

**WoodenBoat**
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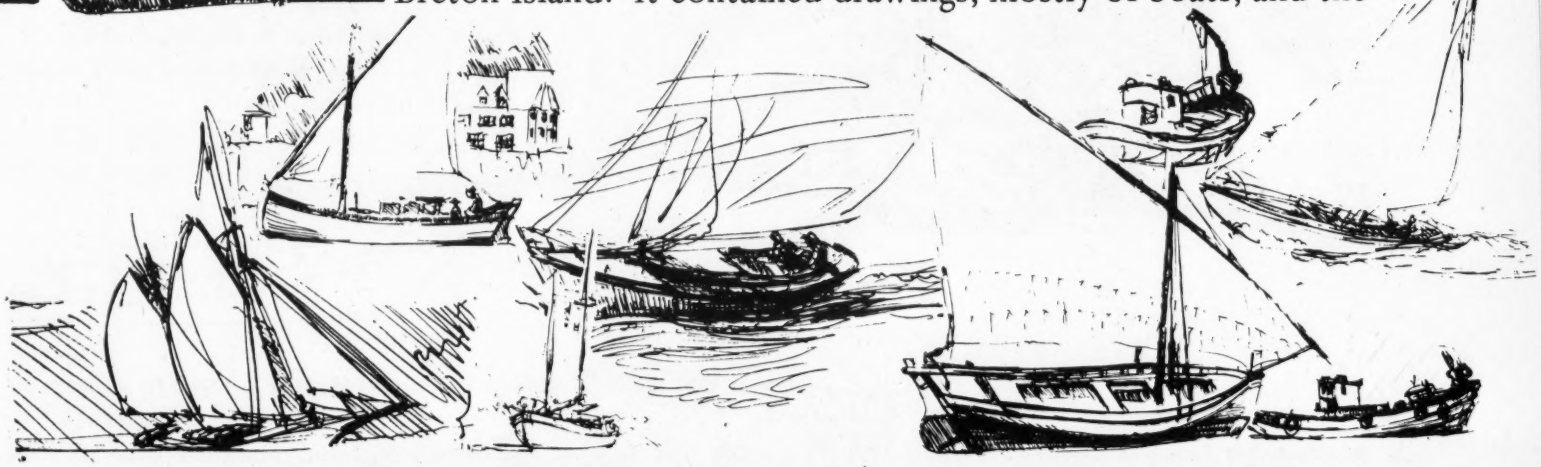
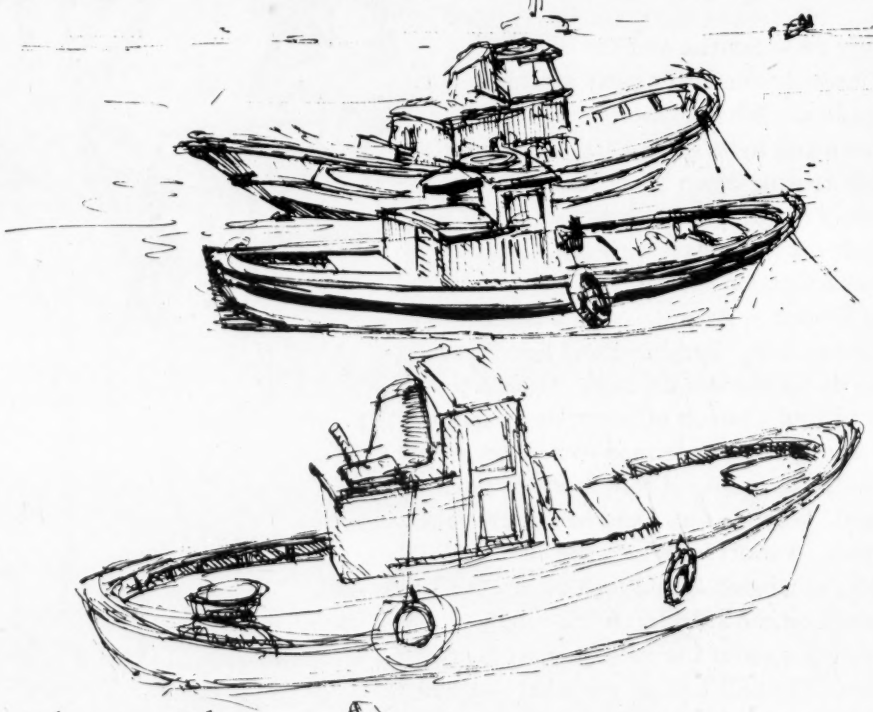
A FEW WINTERS AGO we received a package in the mail from Cape Breton Island. It contained drawings, mostly of boats, and the



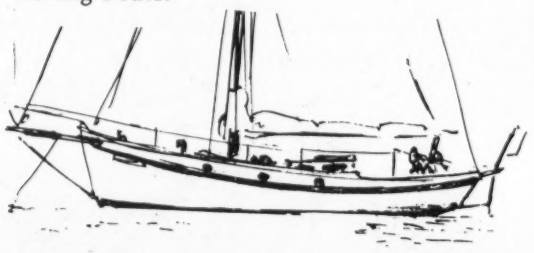
accompanying note said something like, "Hi. Buck draws pictures of boats while he waits for the spring thaw, and I thought you might be interested in some of them. Becky."

Indeed we were, so interested in fact that we asked for more and published a good many of them. Since then, Buck Smith and Becky Hitz have sailed along our coast in their self-built 34-foot cutter *God's Bread*, visited awhile, then crossed the Atlantic to see the other side, made the passage back, and are now in New England waters again. All the while, they kept a logbook, which they kindly lent to us. The drawings by Buck and the snippets of their text are reproduced here from their log. —Eds.

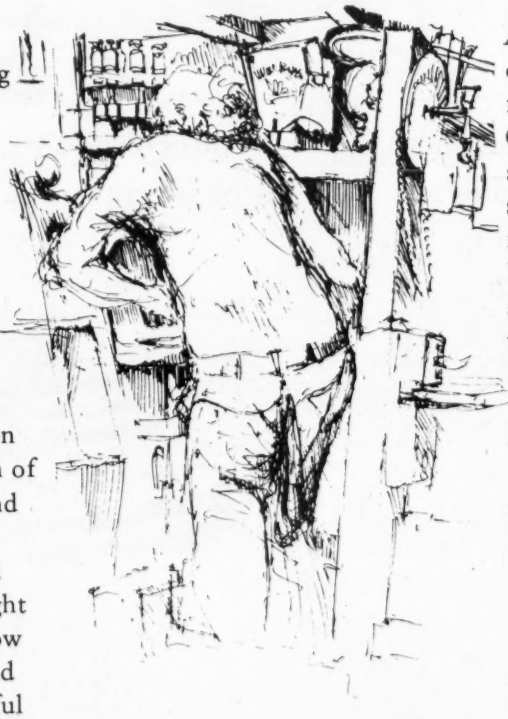


*Sun. July 10, 1977* — 0900, Wind N.E., 10 knots, Barom. 31.7. We leave Gloucester Harbour. Course - 165°. Passing just south of George's Bank. A fine day.

*Tues. July 12, 1977* — Much good food on the boat. Big fresh fruit salad yesterday — Watermelon, bananas, yogurt. Boat self-steering well with line running from staysail to tiller, with elastic cord from tiller to rail. Course change to 140°. Passing over George's Bank. A decided change in the color of the water. Noticeable ground swell, many fishing boats.



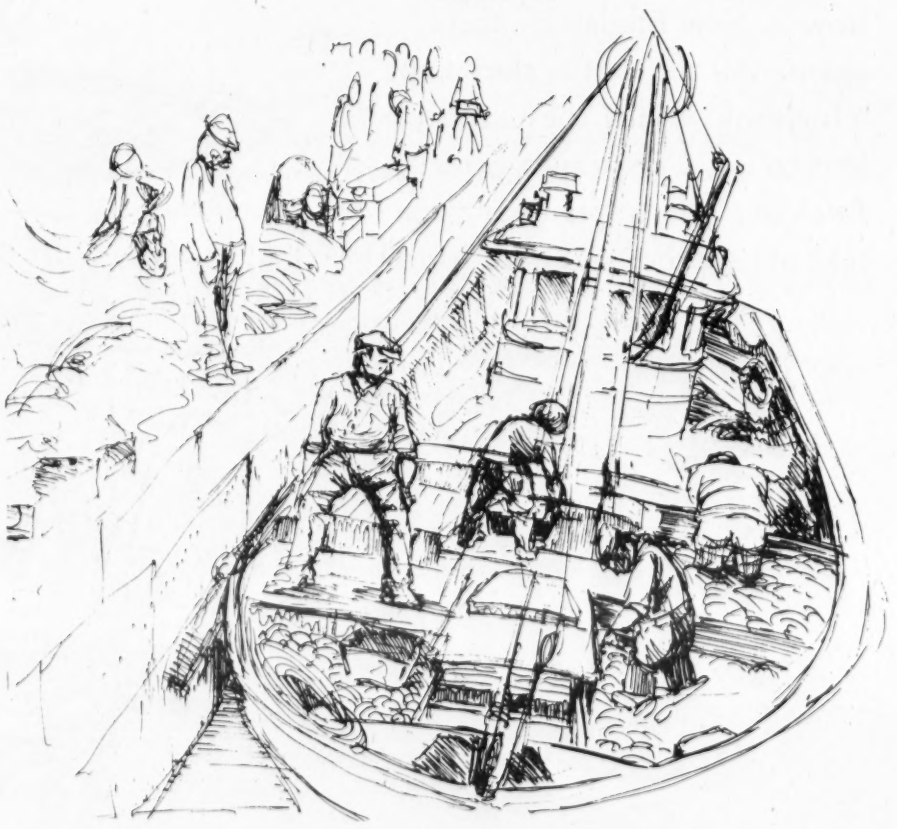
*July 21* — Last night was a real bugger. Down to staysail alone, heavy following sea. Becky and I sitting in cockpit, singing together to ease the time. Top of the antenna lit up with St. Elmo's fire. A long night.

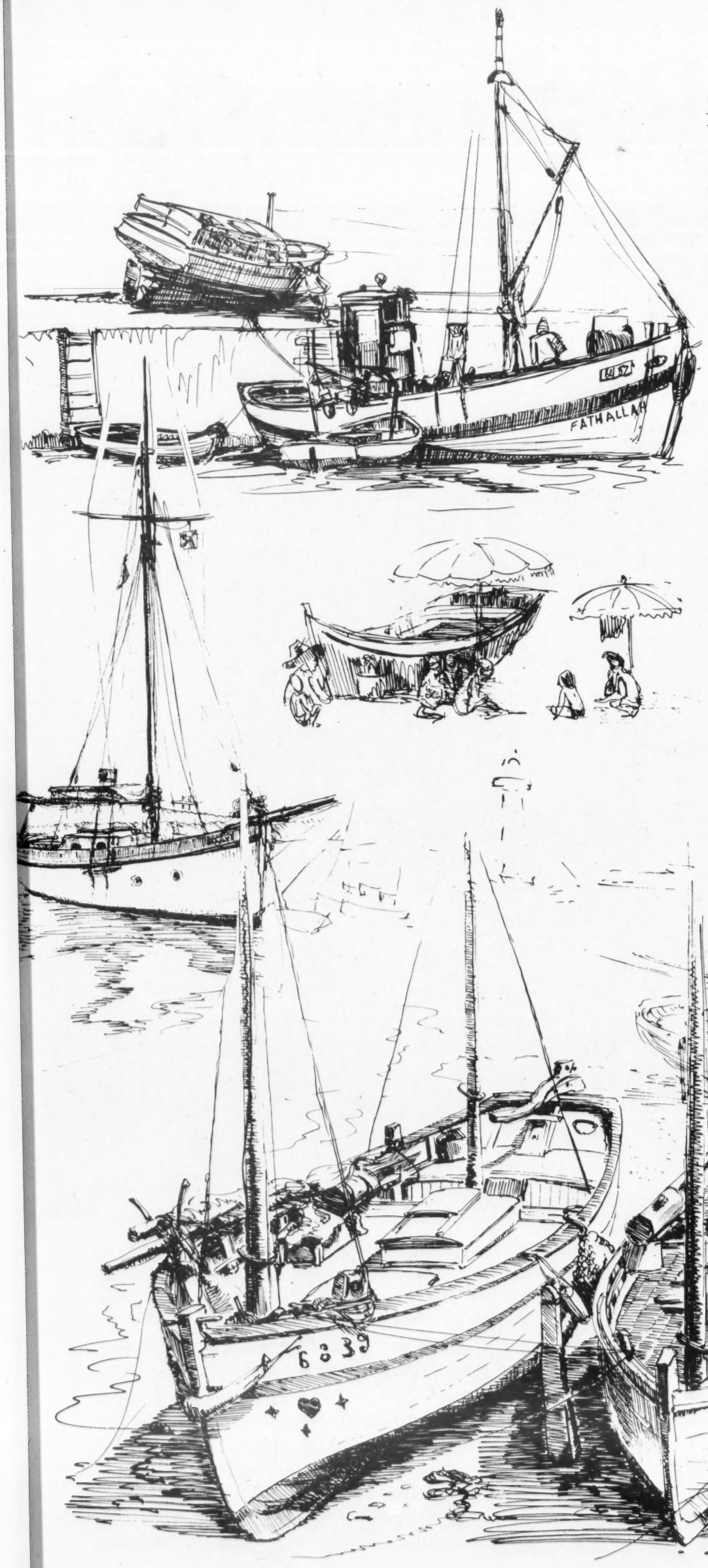


*July 29* — Sunrise and the island of Florese looms in the early morning shadows. What a fantastic sight. All green and rock, steep cliffs with water falls roaring down into the sea, rocky hillsides with pasture land and forest on their tops. We have arrived. The town of Santa Cruz on the east side of the island of Florese — Azores. After a trip of twenty days. Becalmed and light head winds for the last six days. Tucked right in behind a bunch of rocks, down below the town. A young man rowed out and piloted us in. A bit rolly but a beautiful sight. Went to shore and had a few cold beers. A short walk into the country side, untangled an old man's goat, fell asleep on the hillside. A full moon coming up over the rocks and sea right now. The hills behind town have turned deep greens with the whites of the buildings standing out front.

*August — Azores* — Went to a Fiesta over on Pico today. Took the local ferry boat and then the bus to San Mateo. Quite a religious affair. Went up a side street to get away from the crowd and sun to rest, and got caught right in the middle of the main religious procession. People crawling on their knees down the street. A long silent procession and we viewed it all, from 2 feet away, trying to maintain a most humble air about us.

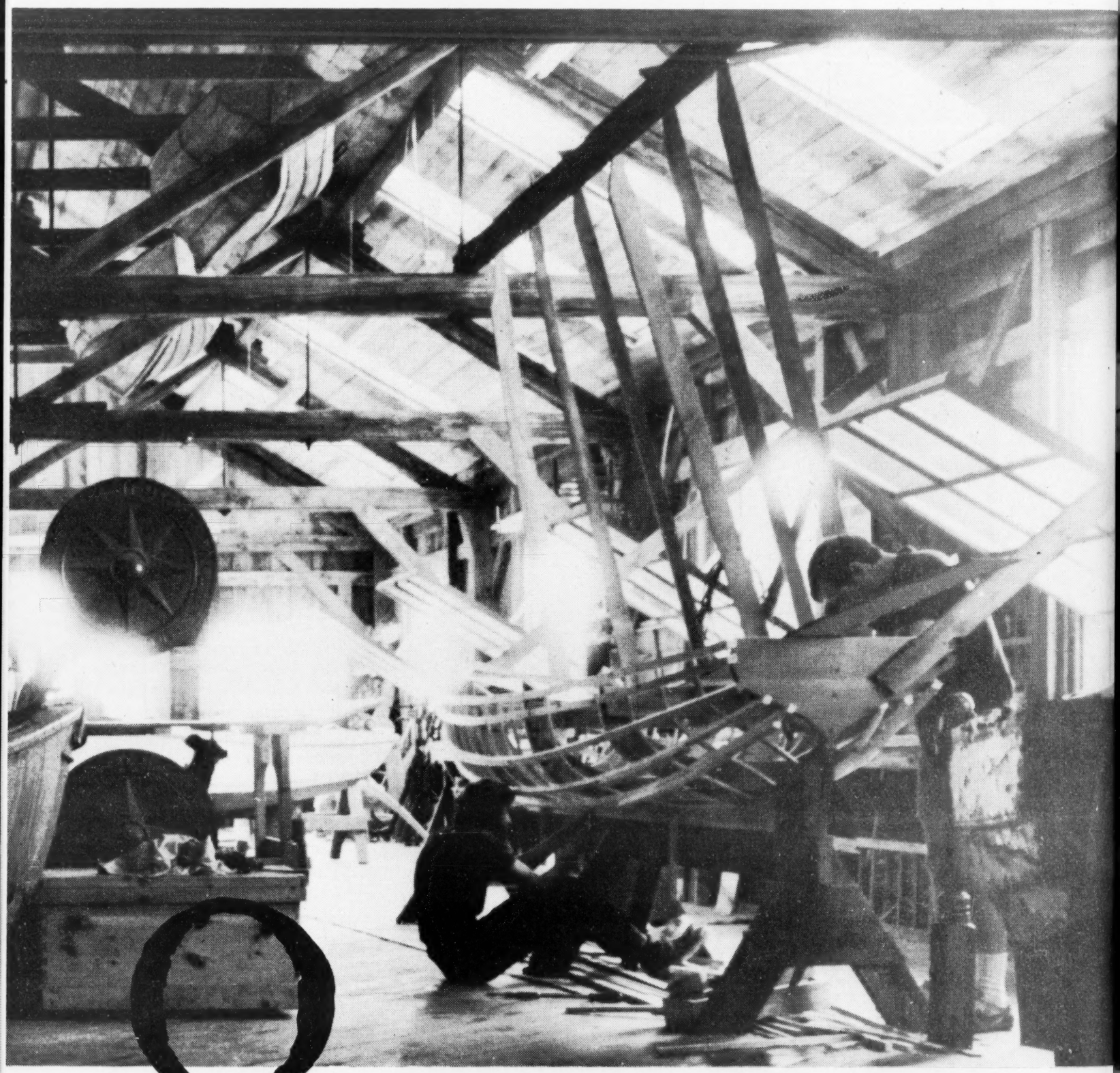
*Early September — Portugal.* A great amount of activity at the fish pier. A great amount of the people take part. There is work for many. All fish are unloaded by hand. And is this so bad or old fashioned? It gives more people work. Something for everyone to do. Fish for all.






*Dec. 25* — Alicante, Christmas Day. The big city has been kind to us. For the last four days we've been selling my drawings on the street, and doing quite well. No hassles from the police. We meet many interesting people and everyone is quite kind to us. We've been making from $20 to $50 a day. Becky has been doing most of the selling with myself spending the mornings sketching on the boat. Obie is a part of the show also, with his red scarf he's quite a hit. One kind, old lady brings him bags of meat every day, and pastry right from the bake or meat shop, no meager scraps. In fact, we took the meat one day and made a fine stew from it. Becky's making knitted hats to sell and has sold one so far. We have gained great confidence in the ability to sell our work here in Europe. Strange, but I must admit, how the selling of my drawings and just the appreciation shown them, has inspired me to draw much more and to have more confidence in my work, in turn making my drawing bolder and more relaxed, loose. I could even sell the simplest of sketches. We're set for Europe. We can go anywhere. ■

# Restoration Shop



Photograph: Lincoln Draper

OLD BOATS WERE DESIGNED to serve people who didn't have a lot of money or an abundance of play time, but who cared a great deal about getting home on a draughty night and cared too what their neighbors thought about the shape in which they came home. They went traditional. And that meant handsome and generally small. Small is beautiful. And small is possible.

In the early 1970s, the people who built the Apprenticeshop at the Maine Maritime Museum made *it* small – about the size of an old sail loft they dismantled in Waldoboro, Maine, and then mantled again in Bath. At first there was room to build a number of primitive batteaus for a Bicentennial assault on Quebec that the Arnold Society undertook after paying a modest price for the boats. There was room enough to start training five, then six, and then eight apprentices – a revitalization of a very old way of life and learning – training them *through and for* the various imperatives of boatbuilding. Plan and err and build and unerr and ask questions and make some of the tools that aren't carried at Sears any more, have lunch and err some more, and finally launch a decent traditional boat then sold to increasingly

# ApprenticeShop *by Lance Lee*

Photograph: ApprenticeShop

caring and perhaps discerning buyers in order to procure the money to go on and train others through building more such small boats.

Between 1972 and 1978 over fifty such traditional boats have been built by these two-year apprentices. The boats range from a 22-foot Muscongus Bay sloop – used originally to capture lobsters in the mid-nineteenth century days of sail, oars, and cheaper lobsters – to a 17-foot Newfoundland skiff – originally used to stalk seal well off to the eastward. Another: the Cape Ann dory, a 22-foot open boat used around Gloucester, Massachusetts, and more recently off the coast of Maine to train the kids of a reform school in "weather," experience and responsibility at sea rather than in the slammer. Several different flavors of "peapods" – 15-foot double-ended fishing craft used extensively in the Gulf of Maine for over 150 years – have been built, some 12 of them. These boats are found now from Arizona to the mid-Atlantic on trailers, in lakes, and under the care of the skipper of a Baltic brig named the *Unicorn* and a mid-westerner who overcomes the Ohio blahs by going to the water for the strange and unique renewal that comes from rowing a peapod in corn country.

*more*→

Along the way this Bath crew has had Other Intentions moving, too. By operating as a school of traditional boatbuilding and as a maritime museum, they've been able to share the technology, beauty, and fascination of boatbuilding with some 40,000 visitors a year who pay a small sum to look on and thus help keep the overhead in sight. In the fancy buzzwords of the age, they call it "multi-use," and that means they do several things at the same time, sweat out schizophrenia, and balance the budget because of it all. It makes very real sense in this crazy climate of Inflation, Decline of Practically Everything, and Bafflement. The essence of it all is to build a shop yourselves. Don't even get into a dialogue with contractors – you can't begin to afford that without massive government funding, which is a route you may not really wish to go.

THERE ARE THREE elements to the Apprenticeshop. First, it is a boatshop, a place to re-explore hard, meaningful work in wood, metal, fiber, and "handling" – the latter meaning all of the old, old ways of using the wind, the tide, the fulcrum, the scrap, the advice of an older practitioner passing by, the old hardware found under a bench in New Bedford, etc.

Second, it is a school. Nothing makes more sense to us than starting again to train for *capability* rather than for *knowledge.* Train all kinds of people. We take on volunteers, high school kids, apprentices, interns, and night boatbuilders. The last two mentioned, gaining experience in pure, hands-on boatbuilding, pay a tuition – that helps the overhead. The others all work on a "labor-for-learning" basis. They've built a dock, fashioned a drying shed, maintain the fleet of in-water boats in which everyone blows off steam and also learns how to handle older sailing rigs, such as the sprit sail, and have taken down many old barns and buildings (a used yacht club, a passé swimming pool, a railroad repairs building, a lumberyard's storage shed).

And third, the Apprenticeshop is a museum. As part of the Maine Maritime Museum, the 'Shop's efforts are not simply to preserve skills and practices as distinct from artifacts and archives. The real effort is to encourage the visitor to see the changing nature of a modern museum, one preserving the traditional quality of life through training the next generation, and to see a model of what can be done in his or her own state or community, perhaps in leather working, or adobe construction, or making Shaker furniture. All of these schemes afford a service in creating a facility in which those who come afterwards will gain as much as those who contributed to the original effort. No one gets "rich" monetarily as a result.

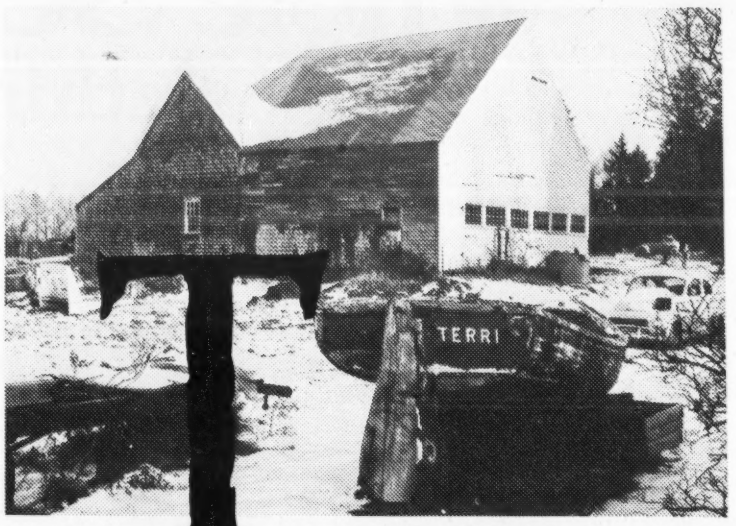
IT'S IMPORTANT TO SEE that the blueprint here has been to set in motion the antithesis of what most other institutions are basing their operations on. That is, all shop spaces (and offices) at the Apprenticeshop are heated with wood, boats are built in the most difficult possible way rather than the quick and easy – of wood, to exacting standards, by a rule of "overkill" rather than sales based on "what the traffic will bear." This inspires people. It gives them pride and affords them an outlet for all of the stifled idealism, care, and hope that the newspapers assure us we have not a prayer of practicing because of the GNP and inflation and the necessity to make it all "pay." Not a little of the "payment" here lies in the spiritual returns of experiencing pride, care, integrity, non-compromise. These are all concepts that Ben Franklin and Ralph Waldo Emerson are still preaching upstairs but which supposedly "don't fit into the lifestyle of today." They are not abstracts but returns that stem from spreading gravel Tuesday, repairing the truck, spending a week (once in 1977) lugging mud up out of the foundations, and talking endlessly to visitors whose comprehension has occasionally been the subject of unflattering ancestral speculation.

They encourage volunteers to bust their tails – to overwhelm themselves out of passion rather than calculation for gold – and drift that practice over into whatever else they may do next. Everything here seems based on the recognition of a marvelous paradox: Those who slave to create something

they are proud of come away with a priceless inheritance, pride, and a spiritual buoyancy, while those who work only for the dollar appear to spend their major energies seeking ways of doing less for more money. In Bath the suspicion is that the "spiritual equation" will never be balanced by the latter practice. Having flown under this flag for seven years, the Apprenticeshop thrives and attracts students who range from the 19-year-old, burned out by an overly cerebral education, to the vice president of a Canadian engineering firm and a practicing surgeon. Perhaps John Gardner's magnificent phrase, "self renewal" covers it in the latter cases; sheer hope in the former.

But in any case, the success of the Apprenticeshop led, in 1978, to the decision to create the Restorationshop, a new program that incorporates hands-on apprentice training, the display/storage of a museum collection of historical small boats that runs back over 100 years and comprises a "reference library" for training, and a high school program offered without tuition in part by those same hands-on apprentices. (Old boats are not restored; old habits, skills, attitudes, and boat types are – hence the name of the Restorationshop.) Some folks pooh-poohed the project, suggesting that it was all very well in '72 but the economic climate was different and things had declined, kids don't *care* and atrophy had set in and so on and so on – it couldn't be done again in Utah or Sandusky, and it was just a sometime thing. But the work went on nevertheless.

So about the first of April last year work began on the Restorationshop, a *three*-story building with a *four*-flue, three-story chimney. The design and building of the Restorationshop stemmed from six years of experience at the Apprenticeshop. It's a progression: more complex and extensive building, tighter rationale in its multiple uses, and a far broader involvement of many, many community resources – materials from the cement factory, barter for bulldozer time, and labor from a teacher's college (Keene State in New Hampshire) and Outward Bound (Hurricane Island in Maine).




THE STORY OF THE Restorationshop's development – the dismantling of seven buildings and the building, using materials from them, of another structure, is the tale of what can be done in any community; what old, old habits of persistence, cussedness, care, and excellence can do. All this happened in 1978 in Bath, and the thirty-four volunteers who were trained in organization and leadership as well as post-and-beam construction are spread out all over America. They are "sown" in other communities in the hope of creating a tangible series of future projects, profit and nonprofit, all over this continent.

An acknowledgement: The idea of the Apprenticeshop and Restorationshop is far from new. In its essential form it arose in the Black Forest of Germany in 1936. Under the regime of Hitler a man named Kurt Hahn was thrown in prison for daring to oppose the jackboot killing of a youth in the streets. Out of that event rose a powerful force and voice inciting the West to respond to the many declines that Hahn then perceived – the decline of compassion, of fitness, of initiative, and of craftsmanship. Hahn cried out for "islands of healing" in which youth might overcome "the misery of unimportance." His greatest contribution must be his paradoxical adjuration, *not* urging youth to line up for a free lunch but rather for responsible work. "Show them they are needed." The Restorationshop and the Apprenticeshop are living monuments to the magnificent response to that cry. ■

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**Monographs from the Apprenticeshop/ Restorationshop**

The Apprenticeshop/Restorationshop has put together a number of fine monographs on various subjects. These little booklets are informative and handsome, and go a long way in explaining what the Maine Maritime Museum's schtick is all about. To buy a monograph is to support the apprenticing program.

—Eds.

*Half-Modelling,* $1.50 – the history of half modelling and instructions (including plans) for building your your own.

"Preservation of a Tradition," $ .60 – reprint of an article in the U.S. Naval Institute *Proceedings* on the concept of apprenticeship.

Two monographs underway; will be available in late fall 1979 at $3.00 apiece:

*Three Norwegian Boats*
*Barns, Beams and Boats*

Monographs available for a donation to help cover printing, postage, and handling (Aw, come on, send a couple of bucks apiece):

*Apprenticing Revived*
*The Crotch Island Pinky Restoration*

Order from:

The Apprenticeshop
Maine Maritime Museum
375 Front St.
Bath, Maine 04530

# Whole Sea Catalog
## (or something like that)*
## Vol. 6½**

*by George Putz*

*by Peter H. Spectre*

You may recall 1968 . . . It was a really great year; fun, relaxing, a carefree time that gave then and gives still proof to the adage that golden ages are always in the past. We'll not gaze on such times again. Anyway, we were having such a good time that we quit our job, quit speaking to everyone, and developed four or five new nervous disorders, and began a book that was going to be called *The Freak Builder's Boat Book.* The *Whole Earth Catalog* had become this terrific meaty and successful thing, this great seedpod of personal wherewithall to kiss it all off and settle down to some serious floundering, except it didn't have enough Boat Stuff in it. As a kid there had been this ocean thing, an intensely important bunch of experiences around the sea that had no conscious form until four years of schooling in the middle west discovered, defined, shaped, and manifested it into a raging fixation. The day of graduation we drove all night and the next day 'til we got to the salt water, wherewith we jumped in all standing, begged it for forgiveness, and pledged never ever to abandon it again goddamn ever never! We were into oceans.

*Big wheel go 'round and 'round; Little wheel spin an' spin.*

—Buffy Saint-Marie talking to Fred Brooks.

But this Great Book, the *Whole Earth Catalog* had more pages on achieving Mökja than on getting to the beach, which we always figured was the same thing. But then the IDEA struck. "Great Jehoshaphat," we says to our selves satanically, we says, "This is an idea meant to grow on its own. We need a Whole Earth Catalog of the Sea!" 'N so we settles down to write one through the neurotic haze . . .

We did about fifty pages worth, and then of course got a bloody job, moved, diddled around, and gave it up.

Three years pass and we're living on an island off the coast of Maine feeling rather like Agnes Gooch, wondering what to do now and cultivating bizarre new varieties of despondency, learning to speak fisherman and, eventually, to be somewhere finally that made sense and toward which loyalty entered into the spectrum of natural affections. And through the late morning murk of one of those early days in the Autumn of 1972, two figures disembarked from an outboard-powered seine dory, marched up the beach, and presented their oil-skinned selves at the door. They were David Getchell,

You may recall 1972 . . . Stewart Brand had placed the word "Last" before Whole Earth the year before and suggested that the time had come for specialist catalogs to rise from the ashes. I was working as an editor for a small-time nautical book publishing company. One day, as I read the unsolicited manuscript for the 6,342nd boring cruising story of the year, Dave Getchell, the editor of a sister company — a commercial fisherman's newspaper — walked into my office with a proposal: "Let's do the Whole Sea Catalog (or something like that) and become rich and famous." My ears perked right up with the mention of wealth, and without a whole lot of further thought, I signed on.

So work began on the Whole Sea Catalog (or something like that). My function was to review books, which was simple enough because I had been reading nautical books for years and knew my way around the literature. The other fellow would review the goods and services, which made sense because that, too, had been his business for years. It was all sane and predictable, which really wasn't what we wanted. We wanted something insane and unpredictable. So my colleague went out to get a person who could make it that way.

Our man was found on an island in Penobscot Bay. Many months were to pass before I met him, but in the meantime I heard through third parties that, among other things, he talked to trees: You know: "Hi, tree, how would you like to become a boat?"

I knew we were going to have a publication to be reckoned with when George Putz finally came off his island and stopped by my office. Our first conversation went something like this:

Spectre: Well, what have you been doing?

Putz: Oh, a little of this, a little of that.

Spectre: What about tools? Doing anything on boat-building tools?

Putz: Yes. A bunch.

Spectre: What are you going to say?

Putz: Well, you can't get decent tools, you know. You go into a hardware store and they throw blister-packed trash at you. If there's any steel at all in them, it isn't tempered

**The publisher of the original* Mariner's Catalogs, *with whom we have had our ups and downs in the great western tradition of author/publisher relations, is not keen on our publishing anywhere else but with his Great House, hence the deviant name.*

***This falling between Vol. 6 and the about-to-be-published Vol. 7, it must be 6½, or, as Fred Brooks would say, "Half a loaf is better than none."*

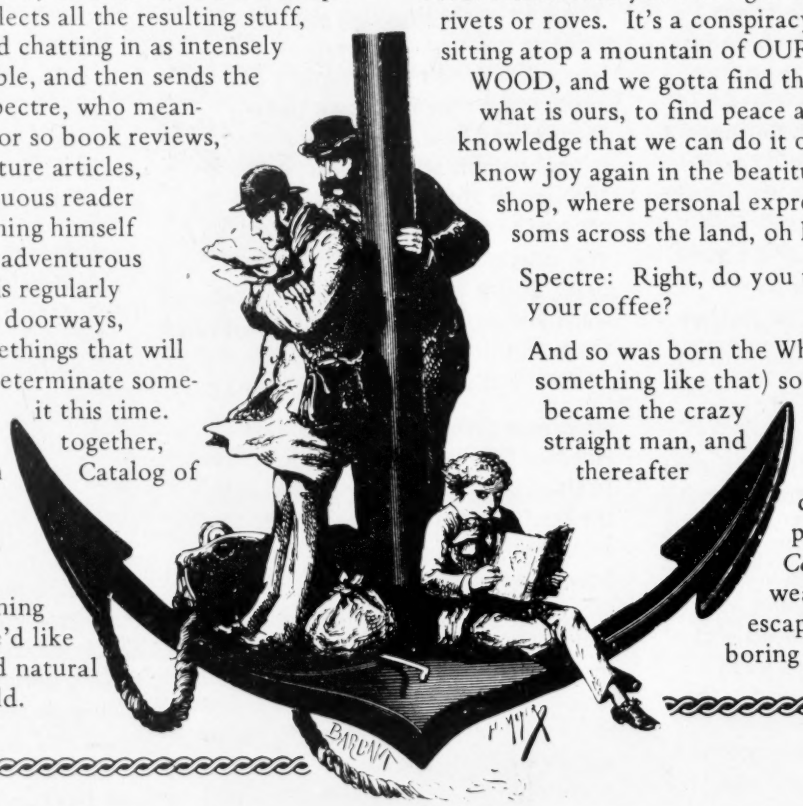
*Putz*

long-time editor of the *National Fisherman*, and Roger Taylor, publisher of International Marine Publishing Company, soon after to become the largest publisher of marine books in the country.

They had this great idea, see: to publish a Whole Earth Catalog of the Sea. Did we have any ideas? There may have been three seconds of pause, but certainly not four, before we allowed as to having no particular ideas, but would a wad of manuscript do? We was on the bus. And have got out a new volume of the *Mariner's Catalog* each year since.

Usually the way it's worked is that Putz thrashes around through a hundred marine journals, broods around the woods and shore with three-by-five cards, writes a couple reams worth of letters, collects all the resulting stuff, edits through it writing and chatting in as intensely peculiar a manner as possible, and then sends the whole mess off to Peter Spectre, who meanwhile has been writing 75 or so book reviews, preparing two or three feature articles, editing through the continuous reader correspondence, and psyching himself up for dealing with Putz's adventurous spelling. Every March he is regularly found sleeping in Camden doorways, babbling about vague somethings that will never work, that some indeterminate somebodies have really done it this time. But it has always come together, and there is a Whole Earth Catalog of the Sea, a Freak Builder's Boat Book, a Mariner's Catalog.

It seemed a very natural thing to ask Stewart whether he'd like an oceans issue. It seemed natural when he said that he would. We're at home here.



*Spectre*

steel. And most of the time there's only one size of each tool — medium and useless. Who ever heard of medium, for crying out loud. Everything is either small or large. Look at a proper tool kit and the medium-sized tools are the least worn. And of course the bloody good tools that used to be available are all hanging on restaurant and barroom walls. Oh sure, sure you can send off to one of these fine tool catalog outfits and get English or German tools, planes at 30 dollars apiece, 500-dollar workbenches, monogrammed screw extractors, and full-sized drawings for a 17th-Century mandolin, but try to get a boatslick or lipped adze, show me a ship auger and I'll quit smoking, lead me to a boatbuilder's bevel, backing iron, or spud and I'll take esoteric vows, and materials to work with, Great Hornitoads you can't get the wood, and no copper rivets or roves. It's a conspiracy. Some heinous troll is sitting atop a mountain of OUR TOOLS, OUR WOOD, and we gotta find the bastards, to liberate what is ours, to find peace and freedom and the knowledge that we can do it ourselves once again, to know joy again in the beatitude of one's very own shop, where personal expression once again blossoms across the land, oh lordy . . .

Spectre: Right, do you take cream and sugar in your coffee?

And so was born the Whole Sea Catalog (or something like that) soft-shoe shuffle. Putz became the crazy man, I became the straight man, and thereafter the other fellow shortly went back to editing his commercial fishing newspaper. The *Mariner's Catalog* never did make me wealthy, but it did help me escape from those searingly boring cruising story manuscripts.

## A note about boats:

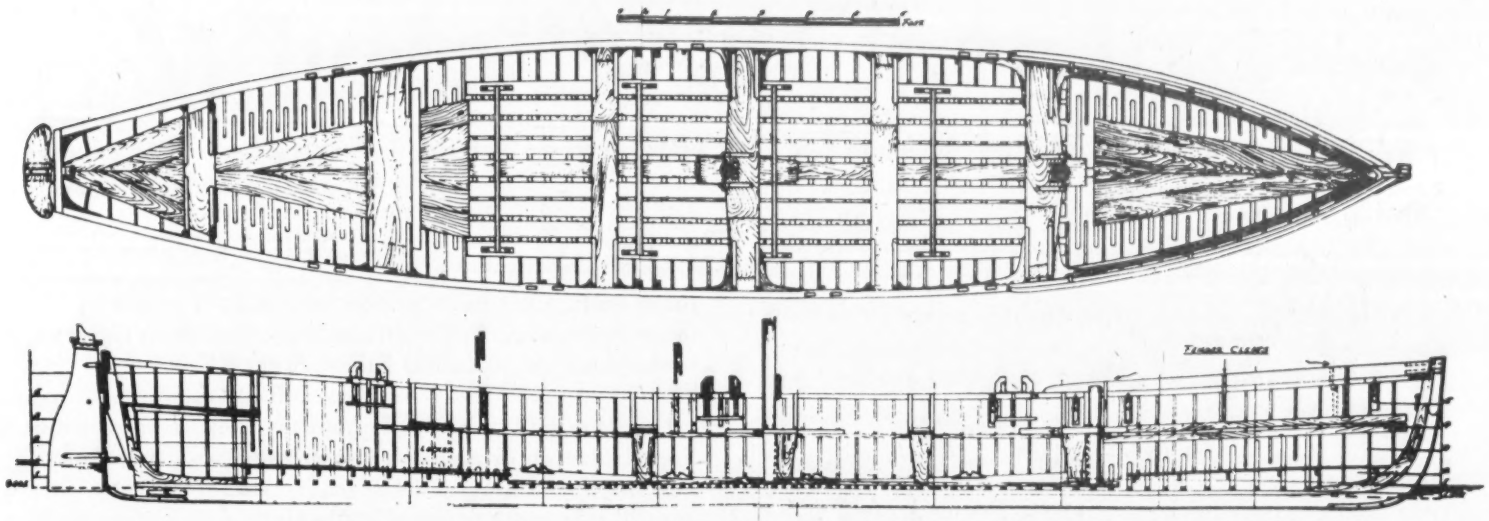
"Shucks man, a boat's just a tool, like any other tool, just as good or bad as the man who uses it . . ." But they can be splendid fun, satisfying in many ways, objects of beauty, pride, investment. They can also tyrannize your life, ruin your bankroll and family life, and kill you. Though there are legendary yachtsmen who have sunk their boats in old age rather than endure the thought of other men owning and probably abusing them, it is generally true that all boats are for sale. The use most boats get is seldom commensurate with their cost, but the disciplined boatperson can often rightfully claim that the pleasures of a boat have no price.

The road to a successful relationship with a boat begins by applying the same considerations toward the would-be boat as those toward any other tool; what does one *realistically* want from the craft, what are the special conditions to be met in the waters where she'll be used, who has to be accommodated — how — and how long at a time, how much dough can be afforded — where are the compromises to be made?

Further advice along these lines be becomes not only cheap, but boring. Those with no interest in a boat could care less, and those with an interest in boats invariably already know what they like and dislike, everyone else taking the hindmost because they're stark, raving nuts. But even those with no interest ought to know that boats are dream objects, powerful ones fraught with what can be an alarming intensity. Just a tiny bit of attention will show you that many boats really are beautiful objects — fine, functional sculptures that carry you and so compound the sensuality of sculpture as it is ordinarily understood. Then, boats over the size of daysailers or small runabouts, those with some sort of living commodation, are little homes that can freely roam territory that we all own. The person with a house has whatever acreage appears on the deed. The person with a boat has, in theory, millions of square miles on which to roam freely, to pick and choose neighbors or to have none whatever.

If in getting down with your bad self, you've found a competitor, boats race. If you are handy or want to become that way, boats demand dozens of skills, all of which contribute to general competence. Building one's own boat is especially satisfying and, if the material is wood, few subsequent woodworking situations will intimidate, for after building a boat you'll probably have been there before.

So, that said, we aren't going to list any boat sources. In seven volumes of the *Mariner's Catalog* we have barely scratched them, and the various annual indexes and buyer's guides available on the newsstands have the industry, which these days



amounts to something like seven BILLION dollars a year, well under control. Too, if you can shop that way or are inclined to, you don't need us — you need the *Boat Owners Buyers Guide,* published by *Yachting* magazine; the *Sailboat and Equipment Directory,* published by *Sail* magazine, the *Motorboat and Equipment Directory,* published by *Motorboat* magazine. As far as that goes, almost all of the boating magazines publish a boat show issue, usually in January as part of their industrial handholding, advertising and editorial making the fun couple we've all grown to know and love.

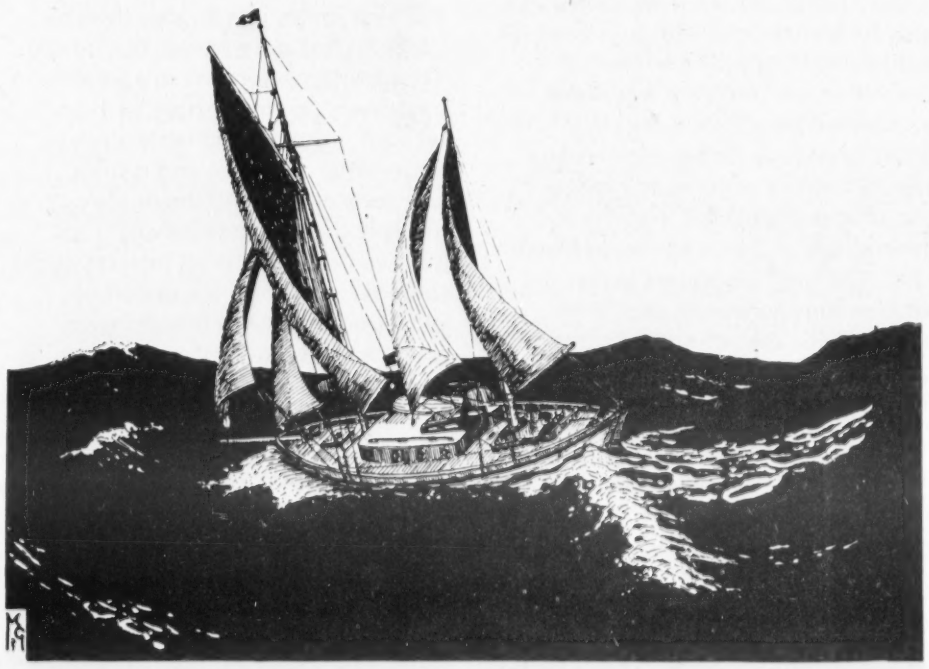
No, we think of boats as very personal tools with, on, and in which some interesting, creative, and important parts of lives may be lived and, of course, livings made. It's even better if you build your own for the usual reasons, plus you know what you have and the personal relationship means better husbandry and management. Boats are demanding creatures and they can punish laxity severely. Debates about what the appropriate materials are for a proper craft are futile, though we do notice that people new to boats, those who jump right in wanting to build, tend to become infatuated with plywood and resin multihulls, cement construction generally, or the refurbishing of some ancient, decrepit hull "some work will fix up." Debates about sail versus power are even more futile and have the added intervention of that addictive killer-drug self-righteousness on the part of sail buffs. To be sure, some middle-aging freaks are turning a dollar transporting goods under sail, and there are a few fishermen around taking a nostalgic crack at it. But livings are made under power, pleasures taken under sail, and anyone who has battled tidal currents, been becalmed for three days with perishable cargo, or been roused from the offwatch to tuck a reef on a pitching deck in a shrieking gale knows why. We like sail and oars on wooden boats. We're also romantic editors and writers.

The best early thinking about boats is done in books. No question it can become a little masturbatory after awhile, but there is much to be learned in books, and all the ideological battles about boats are fought through in them, welding you to the edge of your seat and then leaving you unscathed. Learn and dream first. There are some wonderful learn and dream books that march the possibilities past your mind, and pocketbook, in graceful fashion.

*American Small Sailing Craft* by Howard Chapelle is a precious classic. In the 1930s Chapelle realized that the traditional local types of boats were being supplanted by modern powerboats, and so he combed the shorelines of (mostly) the East Coast looking for the surviving examples from which to take lines. In England Chapelle's counterpart is (was — both are deceased) Edgar J. March, whose two volume the *Inshore Craft of Britain in the Days of Sail and Oar* moves the reader completely around Great Britain, port to port, describing the local boat types mixed with lots of anecdotal stuff about how they were used and who built them. These are about working types. Yachts, pleasure craft, have their classics in the American books by L. Francis Herreshoff, especially the *Common Sense of Yacht Design,* William Atkin's *Of Yachts and Men,* and the beautifully done photographic books of Morris Rosenfeld* and Peter Barlow.*

In the classics department, the English have the edge for numbers of books. *Little Ships and Shoal Waters* by Maurice Griffiths can have you slathering with boatlust in a matter of a few paragraphs, as can any one of the many titles by Uffa Fox* or the book *Yacht Cruising* by Claude Worth. And there are more recent titles that have not yet stood the test of time, but which certainly steep one in nautical mystique and bode well to live on. Pete Culler's *Skiffs and Schooners* can have you staring off into space rendering you useless to terrestrial friends. *Steamboats and Modern Steam Launches* by Bill Durham and Lowell North will feed your local valve and boilerhead. Similarly, *The Sailing Yacht*

*These books are out of print but can be found in libraries with good marine collections or in used book stores specializing in nautical publications.



Good Boats

by Juan Baader and *The Proper Yacht* by Arthur Bieser could have you giving up homesteading for investment banking (ah go ahead, someone has to). Finally, Roger Taylor's *Good Boats* is the distillation of a gonzo romantic boatnut's lifetime of brooding, article clipping, and daydreaming about what might have been had the Holy Ones seen fit differently.

There are scads of other inspirational books, but these are all in the cream if not the whole of it. Besides, if you can afford all these books, you have at least the choice between them or all the wood and fastenings (steel and rodding) required for your first (fairly small) boatbuilding project.

—putz

Access to "A Note About Boats"

**Boat Owners Buyers Guide**
**$3.50**
**Yachting Publishing Company**
**Box 278**
**Pratt Station**
**Brooklyn, NY 11205**

**Sailboat and Equipment Director**
**$4.50**
**Sail Magazine**
**38 Commercial Wharf**
**Boston, MA 02110**

**Motorboat and Equipment Directory**
**$3.50**
**Motorboat Magazine**
**38 Commercial Wharf**
**Boston, MA 02110**

**American Small Sailing Craft**
**Howard I. Chapelle**
**$15.00**
**W.W. Norton & Co., Inc.**
**500 Fifth Ave.**
**New York, NY 10036**
or Whole Earth

**The Common Sense of Yacht Design**
**$29**
**L. Francis Herreshoff**
**Caravan-Maritime Books**
**87-06 168th Place**
**Jamaica, NY 11432**

**Little Ships and Shoal Water**
**Maurice Griffiths**
**Conway Maritime Press**
**inquire**
**British Book Centre, Inc.** (below)

**Skiffs and Schooners**
**R.D. Culler**
**$15**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

**Steamboats and Modern Steam Launches**
**(Facsimile Reprint of 3 years of the Magazine)**
**Bill Durham and Lowell North, Eds.**
**$12.50**
**Howell-North**
**1050 Parker Street**
**Berkeley, CA 94710**
or Whole Earth

**The Sailing Yacht**
**Juan Baader**
**$30**
**W.W. Norton & Co., Inc.**
**500 Fifth Avenue**
**New York, NY 10036**
or Whole Earth

**The Proper Yacht**
**Arthur Beiser**
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**International Marine Publishing Co.**
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**Good Boats**
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## Boats and Harbors

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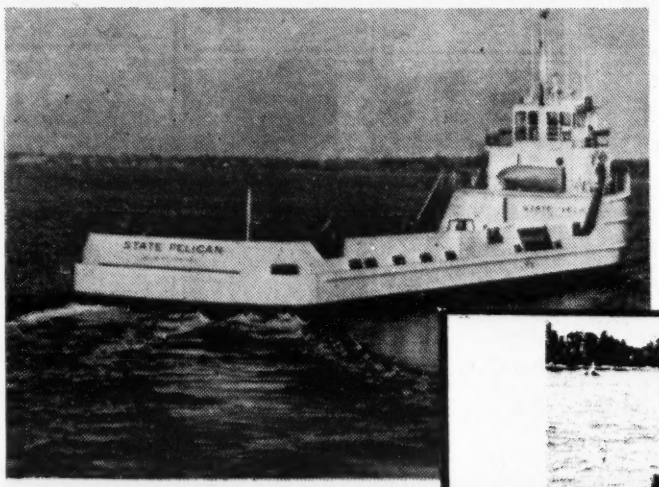
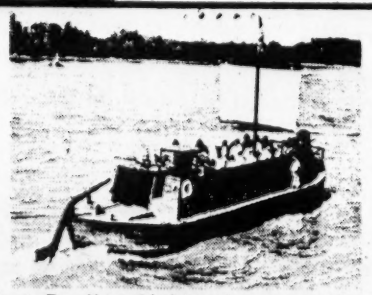
**$4/year**
**Crossvile, TN 38555**

*Stewart said that he likes the* National Fisherman *because it reeks of boatness and all that quality implies. Yes, it certainly does, but it's not funky enough. If you want a* really funky *boating newspaper, then you want* Boats and Harbors. *It's almost all working boats stuff, thousands of them, and the deals can make you cry. A friend of ours recently found in it (and purchased) a 61-foot oyster smack built in 1907 with a diesel the size of your kitchen for $4,500. And steamed home in her!*

—putz




The "State Pelican" was built by Blount Marine. For more information write: Blount Marine Corp., Warren, RI 02885



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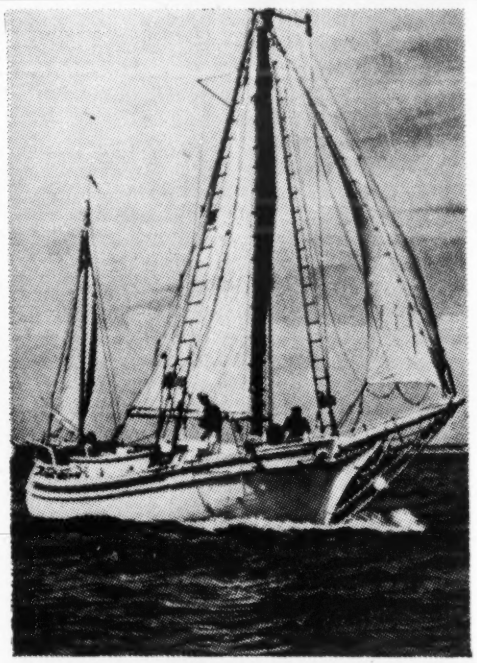
## The Spray

**(Building and Sailing a Replica of Joshua Slocum's Famous Vessel)**
**R.D. Culler**
**132 pp., 1978**
**$9.95**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*One of the more controversial boats of all time is the* Spray, *the oyster sloop converted by Joshua Slocum at the turn of the century and sailed around the world by him single-handedly. The controversy is over the* Spray*'s design — she was built for inshore commercial fishing, not for offshore cruising. In theory, she should be unsuitable for ocean passage-making; Slocum's success at it puts the lie to the theory, though critics are quick to gloss over that aspect of the discussion.*

*Pete Culler, an accomplished boat-builder and designer of traditional craft, built a replica of the* Spray *back in the 1930s and lived aboard and chartered the boat for many years. His book,* The Spray, *is a description of building the boat, fitting her out, using her, and the reasons for choosing her design in the first place. It is instructive for a number of reasons, not the least being how an experienced seaman makes his choices for a boat that he will live and work on for extended periods of time. Pete Culler was a wise man and, even though his*



*The Spray*, replica of Joshua Slocum's converted oyster sloop.

*decisions might seem conservative in this modern, risk-taker's age, what he has to say should be taken seriously if running away to sea is your ultimate goal.*

*—spectre*

From an early age I was exposed to craft that would steer themselves, some better than others. *Spray's* ability to do this was one of the factors that convinced me to build her. Even those who are most rabidly opposed to the *Spray's* model must admit that for a boat to hold any course for long periods unattended is most useful. Among the usual run of craft, such a quality is quite rare. Now, it may be said that self-steering can be accomplished today on any boat by mechanical wind vanes and other new methods. This is possibly quite true most of the time, but the price is complexity. I believe that to be successful at sea we must keep things simple.

•

Probably the most valuable bit of gear a vessel can have, especially one that is going into all sorts of out-of-the-way places, and one in which you have your all, is the ground tackle. Remember, the anchor is a symbol of Hope. Most people on viewing my ground tackle were horrified by the size of it and what seemed to them the terrific amount of "work" to handle it (the idea of work of any kind bothers many). I would explain to them that I never worried about getting an anchor up, but often did worry about getting it down in the right way, right place, and right time, as you usually have to make quick judgments, often in a strange place, to do a proper job. Think about this: you can be confronted with being under a press of sail with a strong wind, in a strange port; things you must think about are other vessels, swinging room, the character of the bottom, depth, ranges, port rules if it's a big one, and some barge in your way just as you want to luff. With experience, dealing with these factors becomes almost semi-automatic, but until you are well practiced, laying down ground tackle is one of the finer points of seamanship. Picking it up again is not that difficult.

## The Dory Book

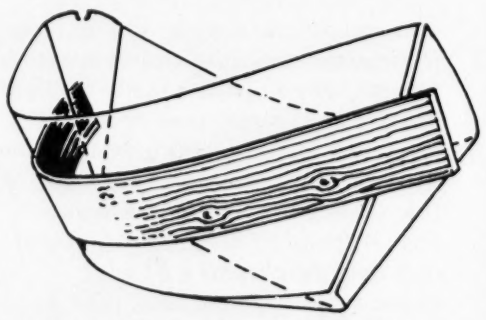
**John Gardner, illus. by Sam Manning**
**275 pp., 1978**
**$20**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*You can't look at a dory without being driven mad with the lust to own one — to see one secured alongside a float in a gentle harbor or swinging to a mooring in a saltwater cove is to see one of the most beautiful, yet simple, small craft ever designed. But dories are strange boats. When used for the work they were originally built for — commercial fishing — they make all the sense in the world, but when adapted for pleasure use they can be unmitigated disasters. To be sure, there are some pleasure dories that are wonderful, such as Phil Bolger's Gloucester Gull, but a straight, unballasted seine dory in a strong breeze and a heavy chop can turn even the strongest rower into a leaden-armed zombie of sobbing despair. Despite that, people continue to be smitten by dories, so if you must have or build one, you might as well have the best information about them at your fingertips.*

*The king of the dories is John Gardner and his grand duke is Sam Manning. Between the two of them is a vast body of dory lore and building expertise. They have written and illustrated the definitive book on dories — their history, construction methods, designs, uses, the whole bit.*

*—spectre*

Dories as a type possess several characteristics that make them especially suitable for amateur construction and commend them to wide general acceptance. To begin with, dories are fine sea boats, especially the perfected,



Plank shapes governed by natural bend of wide boards.

round-sided models developed along Essex County's North Shore. Second, they are low-cost boats, economical to build and to maintain. Finally, they are easy to construct, and adaptable to the use of easily obtainable modern materials without alteration in basic design.

Dory building costs are relatively low because expensive materials are not required, and because the simplified

construction of dory-type boats makes the costs of labor lower than for most other small craft. Of course this saving in labor is not too much of a consideration to the recreational builder, whose own labor costs him nothing more than his spare time. In the matter of maintenance, dories are inexpensive because of their rugged construction, which will take abuse that would wreck more fragile boats.

•

What makes a dory a dory? More than anything, the way it is constructed. As we have seen, dories are wide-board boats, and the boards have a lot to say about what is done with them and the form they take. The material possesses a will and character of its own, a natural bend, in literal fact, that goes a long way in shaping the boat.

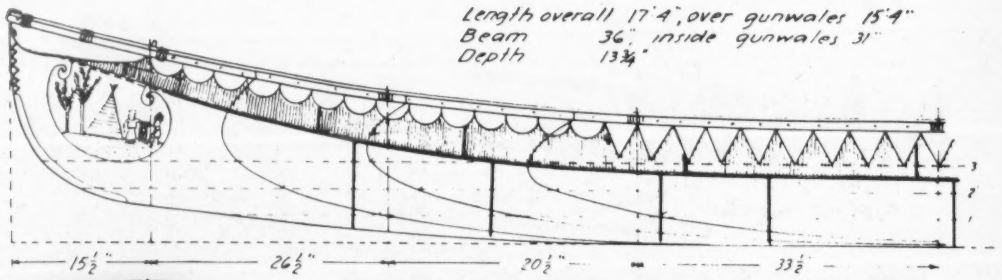
We have assumed that when powered saws were introduced into the vast coniferous forests of central and northern Europe centuries ago, people were not long in devising new ways of building boats from the then-obtainable wide lumber of pine and fir. Eventually, they found the easy way of joining wide boards to form a seakindly shape. Given half a chance, the boards cooperated. The boards showed the builders how to do it. The sides of a wide-board boat are separate and distinct from the flat bottom. Not so in the more ancient, rounded hulls, such as the Norse boats, in which the riven strakes of the bottom twisted imperceptibly into the topsides at the ends of the structure.

## Folding Boats

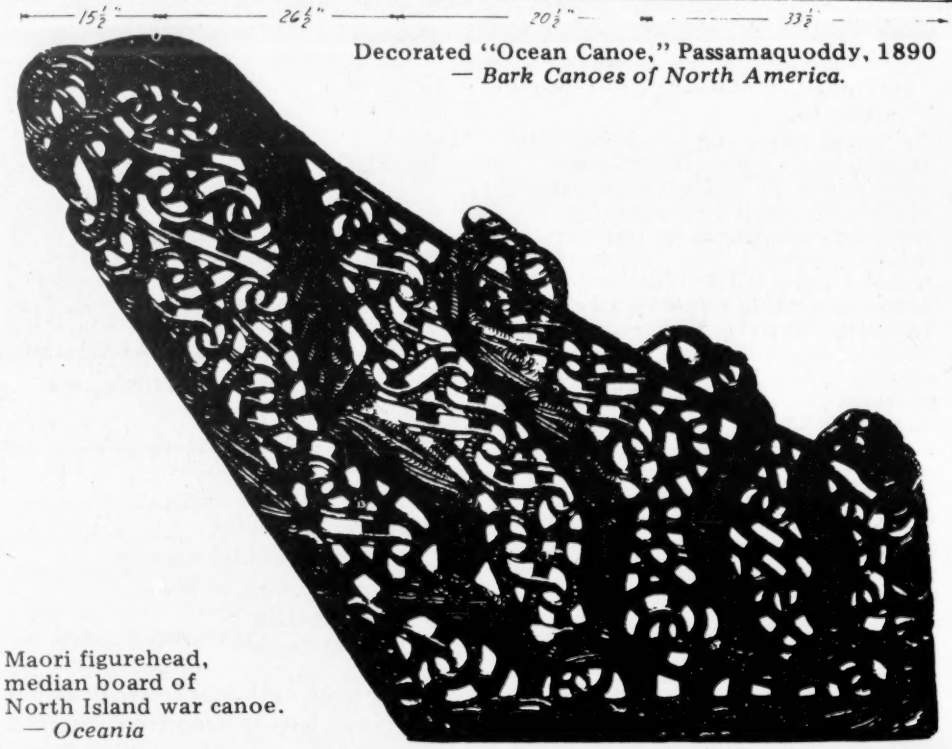
**Hans Klepper Corp.**
**35 Union Square West**
**New York, NY 10003**

*Even the voluntarily simple want their act to catch on. And so boat persons think the world would be better if everybody discovered boating. But there is this hitch, see, of having this big* thing *on your hands, the boat, once you get into it. Hot tubs are about the upper limit of trendy object size. They are sort of small boat negatives. To counter this shortcoming, there are still a few manufacturers of* folding *boats, boats with collapsible frames and tough waterproof fabrics that stretch and lock tightly over the frames. It is generally understood that the German-made Kleppers in several models are the best available.*

*—putz*




**Decorated "Ocean Canoe," Passamaquoddy, 1890**
**— *Bark Canoes of North America.***



**Maori figurehead, median board of North Island war canoe.**
**— *Oceania***

## Two Monumental Works

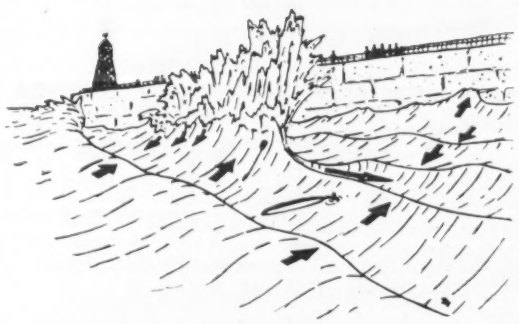
**Canoes of Oceania**
**A.C. Haddon and James Hornell**
**1975 (combined reprint of 3 volumes published originally in 1936, 1937, & 1938)**
**$25**
**Bishop Museum Press**
**P.O. Box 6037**
**Honolulu, HI 96818**

**The Bark Canoes and Skin Boats of North America**
**Edwin Tappan Adney and Howard I. Chapelle**
**242 pp., 1964**
**$8**
**U.S. Government Printing Office**
**Supt. of Documents**
**Washington, D.C. 20402**
or Whole Earth

*Mention canoes and kayaks today, and freshwater springs to mind— whitewater, tranquil streams, northern lakes, that type of thing. But canoes and kayaks are not only freshwater boats; they have been and still are used in saltwater, including the open sea, as occasion demands. The maritime tradition of the canoe and kayak has been long and important, and has formed the foundation of entire cultures, ranging from those of the Southsea islanders to the Greenland Eskimos. Two books make that very clear —* Canoes of Oceania *and* The Bark Canoes and Skin Boats of North America. *Both are scholarly tomes, especially the latter, but they are so thorough and revelatory that reading them is not the chore you would expect, but instead a distinct pleasure, especially if you are open to the idea that today's canoes and kayaks are developing in a progressive sense in construction materials, but certainly not in design.*

*—spectre*

In examining the lines, or model, of a bark canoe, the limitations imposed upon the builder by the characteristics of bark must be considered. The degree of flexibility, the run of the grain, and the toughness and elasticity of the bark used all influenced the form of canoes. The marked chin in the ends of some canoes, for example, resulted from an effort to offset the tendency of birch bark to split when a row of stitches lay in the same line of grain. The curved chin profile allowed the stitching to cross a number of lines of grain. Sometimes this tendency was avoided by incorporating battens into the coarse stitching; this style of sewing was particularly useful in piecing out birch bark for width in a canoe, where the sewing had to be in line with the grain. The Indians also employed alternating short and long stitching in some form for the same purpose. Spruce bark, as used in canoes in the extreme North and Northwest, could be sewn in much the same manner as birch bark, but with due regard for the longitudinal grain of the spruce bark.



Reflected waves and clapotis. If the angle is acute where the reflected wave meets the original wave pattern, and if a big swell is running, the resulting clapotis can be tremendously powerful. The two toppling walls of water will collide almost head on, sending tons of water vertically skywards in a thundering plume that rushes along like an express train. This is *not* a safe area in which to canoe, and the capsized paddler in the illustration is in a bad position. With his canoe and paddle, he must swim seawards clear of the "break" area. His companions can then give him a rescue outside the danger area, where he should never have been in the first place.
— *Sea Canoeing*

## Sea Canoeing

**Derek Hutchinson**
**204 pp., 1976**
**$11.50**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*The English call kayaks canoes, thus this title. This being the only book to cover the subject of handling kayaks in the open ocean, it is also the best. The nice thing about it is that if there were a hundred books on the subject, it would probably still be the best. The author is an intrepid sports kayaker whose techniques are grounded in native practice at sea, making it not only* the *practical manual, but solid ethnography as well.*

*—putż*

Dick Bunyan adzing kayak deck beam out of a tree stump. — *Hooper Bay Kayak Construction* by David W. Zimmerly

The elegant punt with racing crew — *The Folding Schooner.*

## The Kayak Man

**David W. Zimmerly**
**Canadian Ethnology Service**
**National Museum of Man**
**Ottawa, Ontario**
**K1A OM8 Canada**

*The amused look that sophisticated generalists give to devoted enthusiasts hides some envy. Really, there is no such thing as accomplishing a general, sophisticated or otherwise. Meanwhile, the devoted enthusiast day by day accumulates focused work, adding to the world. David W. Zimmerly of the Canadian Ethnology Service has set himself a lifetime project of thoroughly documenting the building of the some 16 basic kayak types of the circumarctic. He seeks out and lives with the builder, filming and drawing the entire process from scrounging to launch. His publications include a glossary of kayak terms (native/english), papers on general methodology, and of course the narrative and photographic record of the builders and their kayaks, the Hooper Bay model being the most completely documented. If you're serious about kayaks, write him.*

*—putz*

## Successful Experimentation

**Small Boats**
**Philip C. Bolger**
**186 pp., 1973**
**$12.50**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

**The Folding Schooner (and Other Adventures in Boat Design)**
**Philip S. Bolger**
**198 pp., 1976**
**$13.50**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

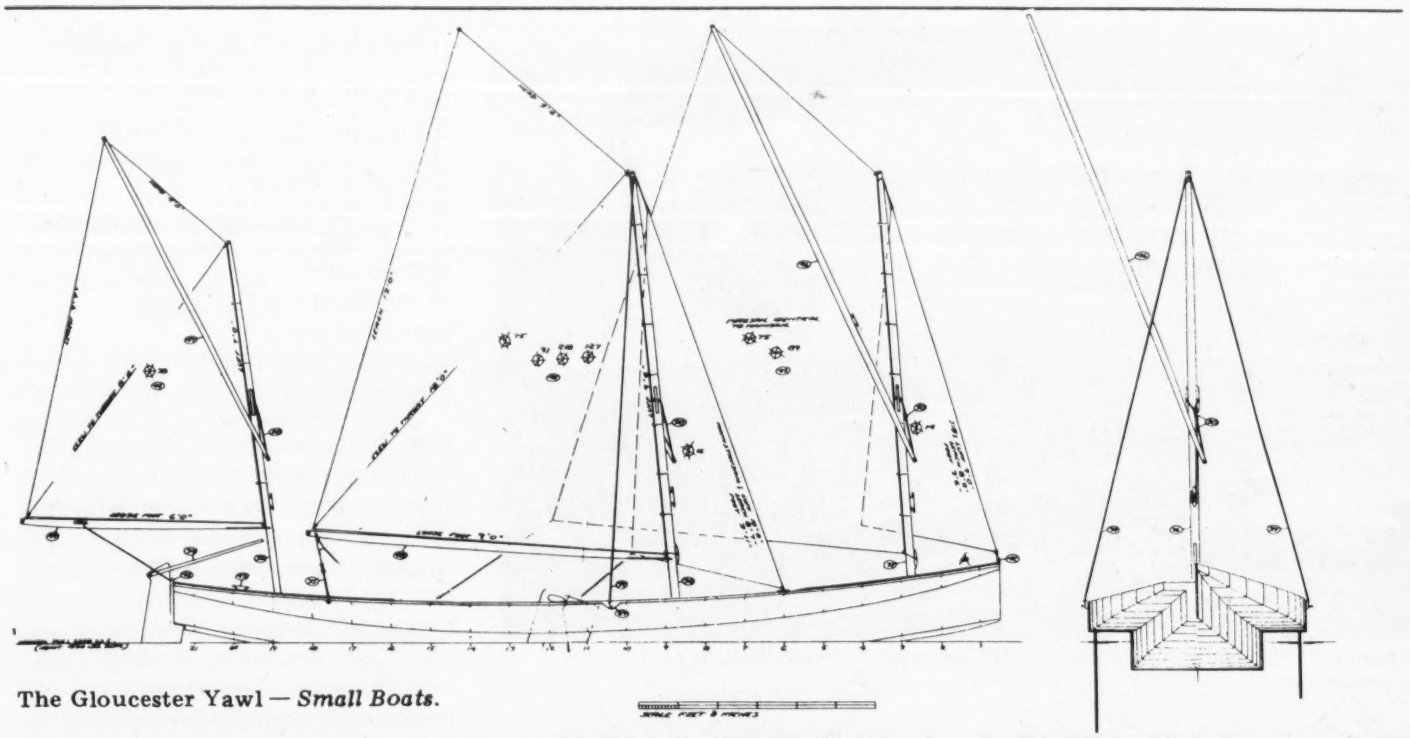
*Innovative thinking is hardly the stock in trade of boat designers. For various reasons — some of them quite logical and rational — boat design is an evolutionary process, where one vessel leads to a modified other. In a way, this is reassuring, because nobody has to worry about radical change — especially as it relates to being embarrassed on the waterfront: "Hey Harold, where'd you get the funny-looking boat?"*

*This conservatism in boat design has caused left field to be wide open, unfilled for years (with the exception of the quick & dirty designs by the wildeyed crazies in* Popular Mechanics*), until Phil Bolger stepped in. Bolger is one of those people who is almost compulsively driven to try something new, such as design a 31-foot schooner that folds in half so it fits on a trailer, or build the best boat possible with only two sheets of plywood, or design a tiny boat with the mast set off to one side to get it out of the way of the helmsman. Trying things like that is one thing; pulling them off is another. Phil Bolger has made his mistakes, for sure, but his successes are legendary among boat nuts. He is the only visionary working today; all others are making modifications to the same old thing.*

*Phil Bolger's books, like his boats, are bold, witty, innovative, exciting, and a cut above everything else. They are an education.*

*—spectre*

A young man came to me with a scheme to take groups of boys out in small boats, for sport and the betterment of their physical and mental health. He had been connected with an established project of the kind, but thought that smaller



The Gloucester Yawl — *Small Boats.*

groups in more and lighter boats would be an improvement. He thought four boys and a counselor would be about right for each boat; this would allow the boats to be light enough for beach cruising, not too heavy to row a good distance, and, it was to be hoped, of a type that could be built in high school manual training shops. He proposed to build the prototype himself.

Generally speaking, I tend to distrust missionary types, but this project was much to my taste, and I agreed to contribute a design, only exacting an understanding that the prototype was definitely to be built, no question of it being a pipe dream.

When I did hand over the working drawings, these here printed, he showed them to a number of people for comment, including a very distinguished yacht designer, and they one and all told him that the design was a disastrously bad one, would be slow and clumsy and would quickly break up. They also told him that Bolger was notoriously irresponsible; wild ideas like this, they told him, were what you got if you didn't hold his nose tightly down on some safe and sane standard. Thinking this over for awhile, he came in to me and explained that he had discovered my incompetence and duplicity and would, of course, not build from the design, but he was willing to let me design him a dory type to a strict specification by his informal committee of experts. If not he would build a Seabright skiff design he had found in one of Howard Chapelle's books. I'm afraid I was malicious enough not to try to tell him what reputation *those* have with boatbuilders not brought up on them.

The moral of all this I take to be: don't trust anybody with pretensions to moral superiority.

As for the design, I'm very sorry it wasn't built. I had beautiful visions of it booming along, three or four in company, in a strong quartering wind, and then stealing up some creek in line ahead with imaginary horned helmets by the steerboard; also of my jigsaw puzzle of bits and pieces turning suddenly into a boat before your eyes in a high school shop with many hands.

## The Case for the Cruising Trimaran

**Jim Brown**
**214 pp., 1979**
**$17.50**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*Multihulls are rare in Maine where we live, so our stay here in California to work on this issue of* CQ *gives us a chance to gaze on trimarans afloat in Sausalito Harbor between studying the tear vale of boats building and never to be launched and the almost painful attractiveness of what the massively successful consumer economy can produce.*

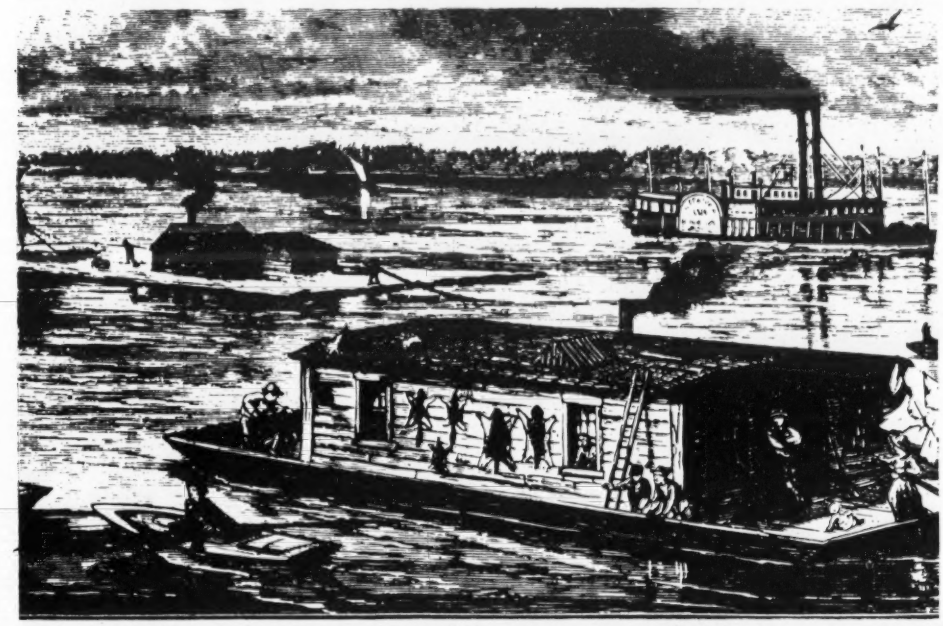
*Trimarans have always fascinated us, as have some sailors' fixations on those craft, and like many other monohull fanciers, we've always wondered why anyone would want to build three hulls when one would do, or why the multihull sailor who wrote* the *definitive multihull seamanship manual went missing in a tri, or why anyone would seriously consider capsize as an option in an offshore passage. Be that as it may, there are plenty of people who* must *have a trimaran, and for them, Jim Brown, among others, is a guiding light. We don't know for a fact, but there could very well be more Brown-designed cruising tris afloat than any others.*

*Jim Brown makes* The Case for the Cruising Trimaran. *His prose reads well, his arguments are more objective than you would expect, and he faces squarely and without obfuscation the bane of the multihull — Capsize: why it happens, how to prevent it, what to do when it rears its ugly head, how to survive.*

*—spectre*

The multihull capsize is a new kind of maritime disaster. It bears some similarity to a sunken submarine with men entrapped, or a lost space capsule. The novelty of an accident in which survivors are provided shelter and sustenance by the wreck itself, but are castaways just the same, leads the mind to conjure up all sorts of horrors. It also gives the press its chance to play to the public's ghoulish curiosity. In recent years, however, real progress has been made toward the understanding of offshore capsize. Like any calamity, it can be prevented, and yet certain preparations must be made to meet it if it happens.

A multihull capsize is not by itself an ultimate disaster. There is a wide gap beween capsize and actual loss of life. Given proper preparations and equipment, and a suitable capsize survival technique, turning over is not nearly as threatening — as final — as the familiar once-and-for-all finish of a boat that's sunk!



Shanty boats — champion floaters of the west — *Four Months in a Sneak-Box.*

## Four Months in a Sneak-Box

**(A boat voyage of 2600 miles down the Ohio and Mississippi Rivers, and along the Gulf of Mexico)**
**Nathaniel H. Bishop**
**322 pp., 1879, 1976**
**$18**
**Gale Research Company**
**Book Tower**
**Detroit, MI 48226**

*The fraction of readers who can seriously consider a boat with accommodations is no doubt small. But there have been some great adventures and splendid fun had in small boats, and one of the all-time classics is a voyage by Bishop, who in 1874 took a Barnegat sneak box, a traditional East Coast gunning type, down the Ohio and Mississippi Rivers and into the Gulf of Mexico. Later on he traveled to the Gulf in a canoe made of paper. Yup.*

*—putz*

In this descent of the river, many persons, who have clubbed together to meet the expenses of a shanty-boat life for the first time, and who are of a sentimental turn of mind, look upon the voyage as a romantic era in their lives. Visions of basking in the sunlight, feasting, and sleeping, dance before their benighted eyes; for they are not all of the low, ignorant class I have described. Professors, teachers, musicians, all drift at times down the river; and one is often startled at finding in the apparently rough crew men who seem worthy of a better fate. To these the river experiences are generally new, and the ribald jokes and low river slang, with the ever-accompanying cheap corn-whiskey and the nightly riots over cutthroat euchre, must be at first a revelation. Hundreds of these low fellows will swear to you that the world owes them a living, and that they mean to have it; that they are gentlemen, and therefore cannot work. They pay a good price for their indolence, as the neglect of their craft and their loose ideas of navigation seldom fail to bring them to grief before they even reach the Mississippi at Cairo.

## The Ocean Sailing Yacht Volume One (1973), Volume Two (1978)

**Donald M. Street, Jr.**
**Vol. I, 703 pp., 1973**
**Vol. II, 595 pp., 1978**
**$27.95 each**
**W. W. Norton & Co., Inc.**
**500 Fifth Ave.**
**New York, NY 10036**
or Whole Earth

*Don Street has done a* Whole Earth Catalog *for sea-going sailboats. He focuses mainly on gear and other material matters — rigs, engines, fittings, stoves, refrigeration, electronics, dinghys, anchors — but certain philosophical views come clear. He likes wood. He likes sailboats without engines. Nevertheless he is highly informative on glass, steel, aluminum, and (what's left of) ferro-cement hulls. And his section on engines is the best I've seen. Street has delivered enough yachts, brokered enough marine insurance, written enough letters to manufacturers, and sailed his own yawl enough thousands of miles to speak with unusual authority. His access-and-evaluation appendices are invaluable. Street is on my shelf next to all the* Mariner's Catalogs *and back issues of the British mag* Geartest.

*—SB*

When oars are too short, the oarsman finds it difficult to get them down into the water, and his strokes develop little power. Throughout the world, boatbuilders, old fishermen, old yacht skippers, all mention the same approximate figure for the length of an oar: it should be twice the beam of the boat plus 6 inches.

•

The towed generator combined with a wind generator certainly seems to be the answer for the cruising yachtsman who has no engine or who wishes to minimize his engine time. Going to windward the wind generator will work; off the wind on long passages, he can throw the towed generator overboard; and in sum, enough power for normal needs is likely to be available. From the evidence already at hand, it appears that the average boat cruising in the trades will obtain up to 72 ampere-hours per day — more electricity than one can really use unless one is trying to run a very small 12-volt refrigeration system from the unit.

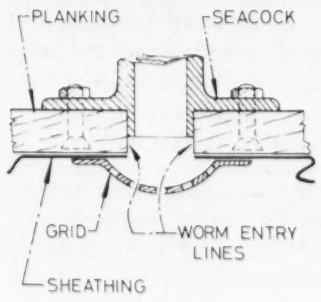
From:
Ampair Products (Hugh Merewether)
Aston House
Blackheath, Guildford
Surrey GU4 8RD, England

## Surveying Small Craft

**Ian Nicolson**
**224 pp., 1974**
**$12.50**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*Why are there so few books in print on this essential subject? Nicolson's is the best of the few, but it's British and still not as thorough as what we need. This is "medical self-care" for boats — how to detect the hidden rot, electrolysis, rust, and dumb design that can lead to disaster or huge expense. It won't make you a professional boat doctor — surveyor — but it sure helps good preventive health care.*

Seacock spigot worm entry prevention. — *Surveying Small Craft.*



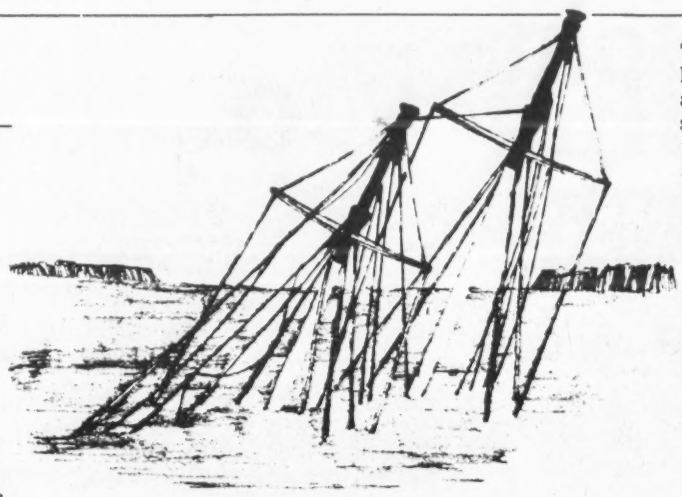

*—SB*

## The Boat Who Wouldn't Float

**Farley Mowat**
**264 pp., 1969, 1974**
**$7.95**
**Little, Brown & Co., Inc.**
**200 West St.**
**Waltham, MA 02154**
or Whole Earth

*Farley Mowat, of* Never Cry Wolf, *etc., once bought a sieve-bottom pocket schooner in Newfoundland and proceeded to get in more hair-raising scrapes with randomly reversing engines, grim fogs, lethal coasts, nefarious humans, fishplant sewage outfalls, and worse, than any 50 other earnest-but-careless cruising men. The written account stands head and shoulders below any other cruising yarn. I think it's the funniest book I ever read. If one cruises to find interesting trouble, this saga is an inspiration.*

*—SB*



The pressure broke the hold of *Itchy*'s anchors and she was driven, stern first, against the projecting timbers of an abandoned wharf. One of the timbers pierced her counter and she went down in three fathoms of filth; for the inner harbor at St. Pierre is nothing more nor less than a sewage basin for the whole community.

•

There was no clutch and no gear box. When, and if, the engine started, the boat immediately began to move. She did not necessarily move forward. It is an idiosyncrasy of the make-and-breaks that when they start they may choose to turn over either to left or to right (which is to say either forward or astern), and there is no way known to man of predicting which direction it is going to be.

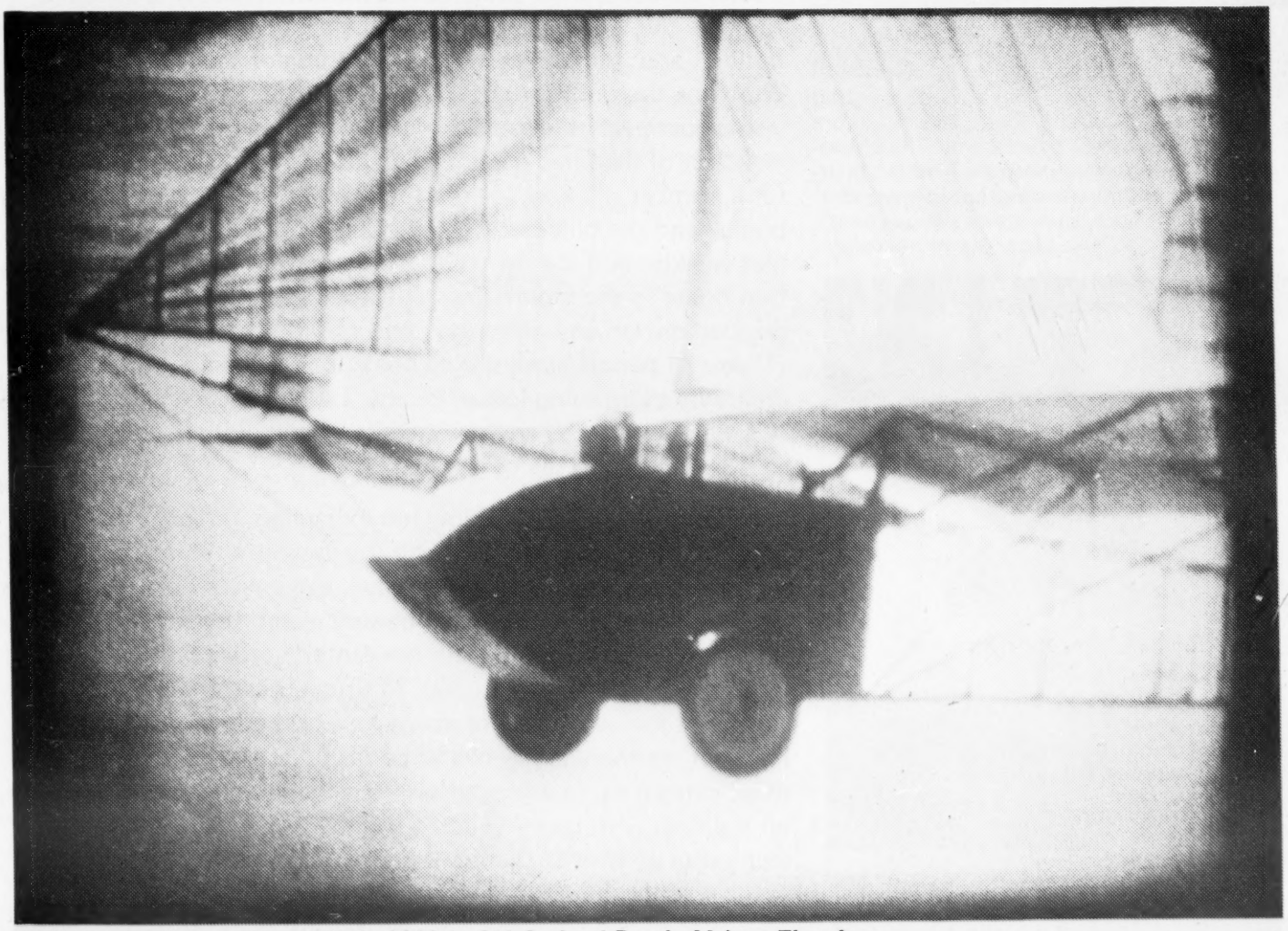
Once started, the direction can be reversed only by snatching off the spark-wire and letting the engine almost die. On its next-to-final kick it will usually backfire and in the process reverse itself, at which instant one must push the spark-wire back in place and hope that the beast will continue turning over. It seldom does. At least it seldom did for Jack and me. To properly dominate a make-and-break engine one must have grown up with it from childhood.

And then the main pump jammed.

That pump was a fool of a thing that had no right to be aboard a boat. Its innards were a complicated mass of springs and valves that could not possibly digest the bits of flotsam, jetsam, and codfish floating in the vessel's bilge. But, fool of a thing or not, it was our only hope.

It was dark by this time so Jack held a flashlight while I unbolted the pump's face plate. The thing contained ten small coil springs and all of them leapt for freedom the instant the plate came off. They ricocheted off the cabin sides like a swarm of manic bees and fell, to sink below the surface of the water in the bilges.

## And then there was the plane that wouldn't sail . . .



Steve Lang/Owls Head Transportation Museum

**Gaff-rigged sailboat glider, built in 1929 in Old Orchard Beach, Maine. The plane wouldn't "fly" under sail alone, so it was towed behind a LaSalle automobile.**

# Boat-Building Books

## by Peter Spectre

ONE OF THE VARIATIONS ON THE FANTASY of running away to sea is building a boat and running away to sea. I have always been puzzled by this – why, for instance, wouldn't a landsman's similar fantasy be to build a car and run away to the highway? – as I am puzzled by the amateur's seeming willingness to risk his life on the ocean in a craft he more than likely built by trial and error, having known nothing about boatbuilding before starting. I would be truly astounded by these wild dreams and lost visions, except I have had them myself and recognize both the causes and the symptoms, the former being perhaps the desire for freedom brought about by self-reliance and the latter being cataclysmic shakes and sweaty palms. As Arthur Ransome once put it, "The desire to build a boat is one of those that cannot be resisted. It begins as a little cloud on a serene horizon. It ends by covering the whole sky so that you can think of nothing else. You must build to regain your freedom."

A small boat's lines have been lofted on the lofting board, and molds are being made from them. The photographs here illustrate wooden boatbuilding because that is my preference; they are of various boats. *Chris Bauer/Apprenticeshop.*

Cutting the rabbet in the keel assembly; the carver's mallet is resting on the centerboard case. *Sandy Johnson/Apprenticeshop.*

Unlike most professional boatbuilders, the amateur variety rarely learns the craft gradually through built-up experience. Rather, he tackles a project cold turkey, ordering plans for a 36-foot ketch or a 12-foot dinghy or a 24-foot cruiser and then figuring out how it all goes together. Craziness it may seem, but I have seen some perfectly marvelous boats built by true beginners (though rarely by those who do not already possess at least journeyman woodworking skills). I have seen many disasters, too.

How does the would-be boatbuilder gain the knowledge necessary to construct his craft? From books, at the least. Boatbuilding books are the shared experience of knowledgeable craftsmen; they are the tutor, the confidante, the guiding light of the amateur builder, and the regular-paying sure thing of their publishers. Show me the publisher of boatbuilding books and I will show you a commercial institution founded on granite, with the steadiest of incomes and the most solid of earnings. I worked for a number of years for the foremost publisher of boatbuilding books, and the bills were always paid on time, the payroll was met weekly, and the owner sported comfortable cars and a vacation home in the mountains. Judging by the number of books shipped out on any given day, one would have to assume that (1) lots of people are building boats, or (2) lots of people are *dreaming* of building lots of boats. I suspect reason number 2; if it were number 1, any day now landsmen will be able to walk to Bora Bora on a sea of home-built craft.

The literature of boatbuilding has expanded in recent years and has kept pace, more or less, with the escapism rampant in some sectors of our society. Not long ago, there were only a few titles on the shelf – solid classics to be sure – and if you wanted hard information on some of the more esoteric types of construction, lapstrake for instance, you had to find a breathing practitioner of the art for help. We are now in the grip of specialization, however, so there are books to be found today on boatbuilding of all categories, in all materials. (I am still looking for the book on building with paper – don't laugh – but expect to see that along shortly if my nose for trends is still good).

But what of the boatbuilding books in print today? What is available and what are they worth? Let's have a look.

## Boatbuilding

**Howard I. Chapelle**
**624 pp., illus., index, 1941**
**$20**
**W.W. Norton** or
**500 Fifth Ave.** Whole
**New York, NY 10036** Earth

The grandpa of boatbuilding books is *Boatbuilding* by Howard Chapelle. In print continuously since 1941, for many years it was the only game in town, and glassy-eyed dreamers would clutch their copies with a death grip. It features carvel construction, wood naturally, with only a nod to the other methods. Its strengths are plenty of detail and a foundation of traditionalism; its weaknesses are a Byzantine organization, dull style (yes, there are stylishly written boatbuilding books), and nothing on the miracle materials and methods that have been developed since WW II. Nevertheless, if you are at all serious, you must have this book.

## Boatbuilding in Your Own Back Yard

**S.S. Rabl**
**224 pp., illus., 1958**
**$12**
**Cornell Maritime Press, Inc.**
**P.O. Box 109**
**Cambridge, MD 21613**

Backyard building is an art form, and nobody was better at it or better at describing it than Sam Rabl. *Boatbuilding in Your Own Back Yard* is a lovely book, unabashedly dreamer-directed but tempered with the reality of building on a budget, mostly in wood. It is for the down-and-out and economically oppressed, and features all sorts of techniques for getting your boat on the cheap, including sections on making your own tools and other gear. It's worth reading just for entertainment.

## Boat Carpentry

**Hervey Garrett Smith**
**178 pp., illus., index, 1965 (rev. ed.)**
**$4.95**
**Van Nostrand, Reinhold Co.** or
**7625 Empire Dr.** Whole
**Florence, KY 41042** Earth

For a book on woodworking as it pertains to boats, as opposed to out-and-out boatbuilding, you can't do any better than *Boat Carpentry* by Hervey Garrett Smith. The author was one of those stalwarts of a slightly earlier era who possessed knowledge, experience, writing ability, and a hand for artistic, yet absolutely clear, expository illustrations. Plenty of information on wood, glues, fastenings, technique, and attitude, though out of date in many ways because of marching technology.

## Clenched Lap or Clinker

**Eric McKee**
**30 pp., illus., paperbound, 1972**
**$5.95**
**National Maritime Museum**
**Greenwich, England SE10 9NF**

The English didn't invent lapstrake (or as they call it, clinker) boatbuilding, but they have had centuries of experience at it. (In lapstrake construction, the planks overlap exactly as they do in clapboard houses.) *Clenched Lap or Clinker* by Eric McKee is a small monograph on this technique, with enough theory and detail to give the reader an introduction that will enable a start toward practical experience. A bonus in this book is a stapled-in pattern for building a cardboard half-model of a small lapstrake dinghy. Good practice.

## Clinker Boatbuilding

**John Leather**
**208 pp., illus., index, 1973**
**$9.95**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

Once you have a grasp of the method, a more advanced book on lapstrake building is *Clinker Boatbuilding* by John Leather. It is a comprehensive book, though some people I know who have used it as a guide have found it difficult in places. That isn't to say that it should be avoided; just that it should perhaps be supplemented with the book that follows.

## Lapstrake Boatbuilding

**Walter J. Simmons**
**184 pp., illus., index, 1978**
**$10.95**
**International Marine Publishing Co.**
or Whole Earth

The advanced lapstrake builder's book is *Lapstrake Boatbuilding* by Walt Simmons, who, unlike many writers of boatbuilding books, is a man who makes his living at the craft. Simmons's book is not really a complete beginning-to-end textbook on the method. Instead, it is intended to answer many of the questions that arise after the building project has begun — you know, the major and minor tricks of the trade that mark the difference between results and *expert* results.

## Boatbuilding Manual

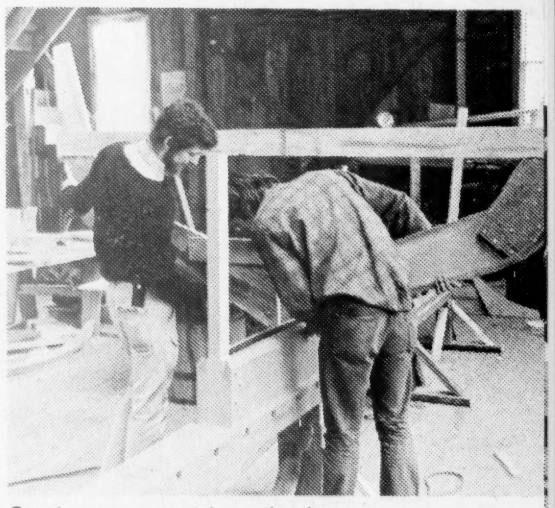
**Robert M. Steward**
**220 pp., illus., biblio., index, 1970**
**$11.50**
**International Marine Publishing Co.**
or Whole Earth

A good survey book that has a little for everyone (less some of the techniques developed since it was published) is *Boatbuilding Manual* by Robert M. Steward. It has helpful information on just about all building methods, though the emphasis is on wood, and shows some construction details not found anywhere else. If you are interested in a project but are uncertain about what type of construction to use, Steward will help you make an intelligent choice.

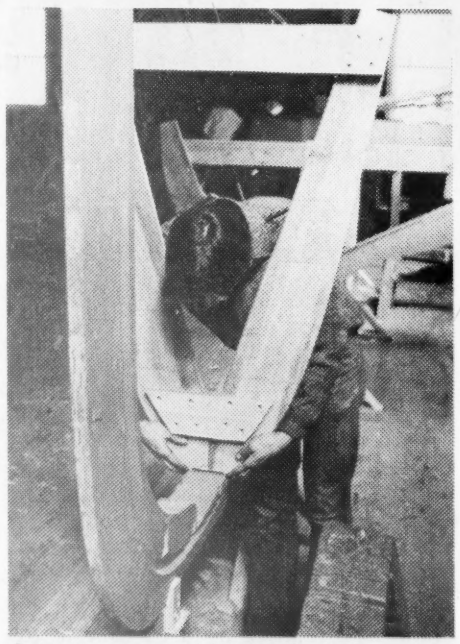
## Boatbuilding Down East: How to Build the Maine Lobsterboat

**Royal Lowell**
**200 pp., illus., index, 1977**
**$17.50**
**International Marine Publishing Co.**
or Whole Earth

Its title might not make it sound that way, but *Boatbuilding Down East:*



Setting up a mold on the keel assembly. The square holes in the sides of the keel are for the heels of the frames. *Stefanie & Thomas Davies/Apprenticeshop.*



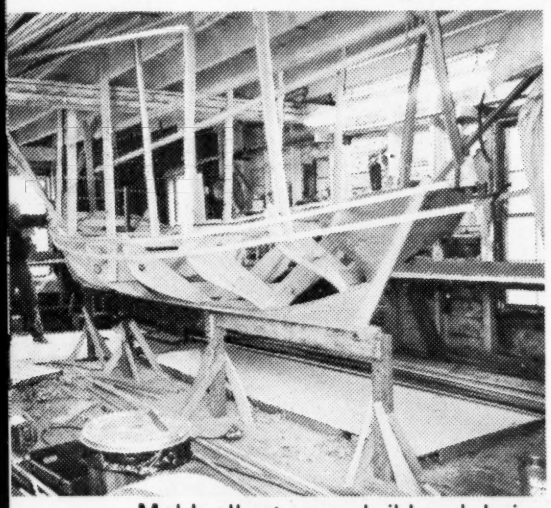
Setting up a mold near the bow. *Stefanie & Thomas Davies/ Apprenticeshop*

*How to Build the Maine Lobsterboat* by Royal Lowell is one of the best books on carvel (smooth plank) construction in print today. The example is a lobsterboat, but the techniques and procedures are pertinent to other boat types as well. The author is a well-known Maine lobsterboat designer and builder. His drawings are as revealing and as technically accurate as you will ever see.

## Building Classic Small Craft

**John Gardner**
**314 pp., illus., index, 1977**
**$20**
**International Marine Publishing Co.**
or Whole Earth

Most of the books described here are manuals on building medium to large craft, say from 20-odd feet and up. For those who wish to build in the smaller sizes — rowing boats, small daysailers, utilities — *Building Classic Small Craft* by John Gardner is the book. The author is an experienced builder with a solid reputation for skill and the ability to make all processes easy to understand. Though he favors boats of traditional design, he has the good sense to adapt today's materials and techniques where applicable. One is able to have, with a clear conscience, one's cake and eat it too.



Molds all set up and ribbands being temporarily fastened in place. Ribbands keep the molds aligned while the boat is timbered and planked. *Chris Bauer/Restorationshop.*

Clamping a plank on a small lapstrake boat. Fastenings are used to hold together the plank edges where they overlap. This boat is being built upside down. *David Lyman/Apprenticeshop.*

## Building the St. Pierre Dory

**Mark White**
**240 pp., illus., index**
**$20**
**International Marine Publishing Co.**
or Whole Earth

There are a few books in print that discuss the building of a particular boat from beginning to end. For the most part, they are worthwhile if you want to build only that boat, but Mark White's *Building the St. Pierre Dory* is an exception. The construction method used for this largest of dories is strip planking, a technique often intriguing to amateurs because it requires little, if no, spiling. To my knowledge, there is no book in print that discusses strip planking large craft in depth as does White's, so if you ache to be a stripper, you'll find this book to your taste.

## Handbook of Artisanal Boatbuilding

**R. Lefebvre**
**Occasional Document CPCA No. 2**
**131 pp., illus., paperbound**
**$7**
**Unipub** or Whole Earth
**P.O. Box 433**
**Murray Hill Station, NY 10016**

You hear much in the alternative press about intermediate technology, and, as in farming and energy, boatbuilding has had a long history in this category. Telling Africans how to build fishing canoes seems rather patronizing — not unlike telling Cajuns how to play the accordion — yet the *Handbook of Artisanal Boatbuilding* does just that, though when you recognize that the canoe in question is really more of a dory, the book is more understandable. After all, dories are not indigenous to Africa. Be that as it may, the book is of interest because it is a good example of making intermediate technology work in boatbuilding.

## Instant Boats

**Harold H. Payson**
**152 pp., illus., index, 1979**
**$12.50**
**International Marine Publishing Co.**
or Whole Earth

Intermediate technology using modern materials (if you are willing to accept such a contradiction in terms) is best exemplified by the work of Harold Payson in his interpretation of the designs of Phil Bolger. Payson's instant boats are plywood craft that are simple, easy to build, and marvelous to behold and use. His book of the same name is informative, thought provoking, and truly delightful to read. If you can imagine and appreciate a down-east boatbuilder describing how to fuse traditionalism with avant-gardism, you will thoroughly enjoy *Instant Boats*.

## Boatbuilding With Plywood

**Glen L. Witt**
**288 pp., illus., 1978 (rev. ed.)**
**$12.95**
**Glen-L Marine Designs**
**9152 Rosecrans**
**Bellflower, CA 90706**

Plywood boatbuilding in its more usual — shall we say *Popular Mechanics*-style — manisfestation is the subject of *Boatbuilding With Plywood* by Glenn L. Witt. That may, perhaps, be a condescending way of stating the obvious, but it shouldn't take away from the fact that Witt's book is must reading if you are to use plywood for planking. Even though the cost of plywood has skyrocketed and its quality has plummeted, it is still probably the amateur's single most favored wood product.

## How to Fiberglass Boats

**Ken Hankinson**
**120 pp., illus., paperbound, 1974**
**$5.95**
**Glen-L Marine Designs**
**9152 Rosecrans**
**Bellflower, CA 90706**

Sheathing plywood with fiberglass is a favorite amateur-builder pastime, as is sheathing worn-out broken wooden boats of all types. You will get arguments pro and con about fiberglass used in these ways, but there is no arguing with some of the successful applications (nor is there any arguing over some of the gruesome failures). *How to Fiberglass Boats* goes into matters like these, as well as how to build laid-up fiberglass craft and how to use Arabol for boat decks.

## Boatbuilding and Repairing with Fiberglass

**Melvin D.C. Willis**
**178 pp., illus., Biblio., index, 1972**
**$10.95**
**International Marine Publishing Co.**
or Whole Earth

For pure fiberglass boatbuilding, the

molded variety, *Boatbuilding and Repairing with Fiberglass* by Melvin Willis has yet to be surpassed, even though the cost examples and some of the technical details have been superceded by later developments. Though production techniques are discussed in a limited way, the author is really talking about custom building by amateurs. To do this requires almost as much work as if a straight wooden boat were built, but if it's a fiberglass boat you want, and it is to be molded, work is what is required.

## Foam Sandwich Boatbuilding

**Peter Wynn**
**128 pp., illus., 1972**
**$7.95**
**International Marine Publishing Co.**
or Whole Earth

Sandwich-core fiberglass construction is much more sensible than molding for one-off amateur building. *Foam Sandwich Boatbuilding* by Peter Wynn addresses itself to using such foams as Airex, but the information contained is also applicable to balsa-core as well. Wynn's book covers all of the salient details, but the examples used in the book are so poorly built that one wonders whether foam-core is worth the effort. Attitude, I expect, is as important as execution.

## From a Bare Hull

**Ferenc Maté**
**534 pp., illus., index, 1975**
**$19.95**
**Albatross Publishing Co.**
**Box 69310, Station K**
**Vancouver, B.C., Canada**

Those who know better would be the first to point out that building the hull is only a small part of building the total boat. And those who have spent time with their calculators have quickly come to the realization that to buy a mass-produced bare fiberglass hull is almost as cheap as to build the same hull yourself. Enter the bare hull suppliers, and enter *From a Bare Hull* by Ferenc Maté – a manual on turning an empty shell into a real boat. Some readers have taken issue with some of the author's assertions and with the fact that the book is a shill for Westsail, a manufacturer of bare hulls, but of the two books I know of that cover this aspect of boatbuilding, Maté's is the best.

## Ferro-Cement Design, Technique and Applications

**Bruce Bingham**
**444 pp., illus., index, 1974**
**$17.50**
**Cornell Maritime Press, Inc.**
**P.O. Box 109**
**Cambridge, MD 21613**

And then there is ferrocement boatbuilding. For a number of years a cottage industry operated, wherein certain cultists – not unlike dome advocates – hyped ferrocement as the route to inexpensive, easily-built boats. Instead, we got cheap, shoddily-built boats. Part of the blame should be placed on the shoulders of the writers and publishers of f-c building books, who were too quick to tout a good thing before the kinks were ironed out. So ferrocement got a bad name before this veritable encyclopedia on the subject was published. I daresay that if you were to follow Bruce Bingham's advice in *Ferro-Cement Design, Techniques and Application,* you would have a boat to be proud of. It's too bad it was not the *first* book on ferrocement to be published.

## Boatbuilding With Steel

**Gilbert Klingel**
**248 pp., illus., index, 1973**
**$15**
**International Marine Publishing Co.**
or Whole Earth

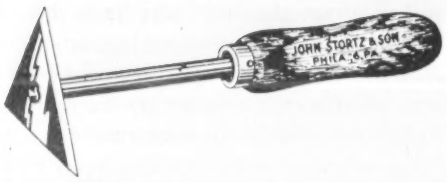
Earlier in this piece I suggested that some boatbuilding books are stylishly written. *Boat Carpentry* is one; *Instant Boats* is another. But the best in that category is the least likely of the lot: *Boatbuilding With Steel* by Gilbert Klingel. The author is a boatbuilder-turned-writer or writer-turned-boatbuilder (take your choice), and he does both jobs so well that you almost wish you could build a steel boat even if you hate welding. There are some compelling reasons to choose steel for your boat, and Klingel lets you have them in a convincing manner. He then tells you how to do it in such a way as to have you imagining yourself tearing lightning bolts from the sky to build your craft of legend. And along with Klingel's discourse you get a bonus chapter by Tom Colvin on aluminum construction.

Dubbing off the frames with an adze to make them fair for the rest of the planking on a carvel (smooth-plank) boat. *Steve McAllister/Apprenticeshop.*

Driving roves over copper rivets to fasten a lapstrake boat. After the fastening is completed, the interior will be finished out. *Alice Brown/Apprenticeshop.*

There are a number of other books on boatbuilding around, some in print, many out of print, but the above are in my opinion the most valuable for amateur builders. No one of them is the last word, nor are all of them together, but if you had a copy of each in your reference library, most of your questions would be answered.

One more thought: I have done a substantial amount of crawling through the shelves of used-book stores, especially those that specialize in nautical books. Titles are easy to find in some subjects – cruising and how to sail come straight to mind – yet I have rarely found a boatbuilding book, good or bad, in a used book store. Which leads me to believe that boatbuilding books have some sort of magic for us, that they are talismen perhaps, and once purchased they stay with the owner to be passed down to succeeding generations. If that is true, craftsmanship might one day die, but it will always be remembered. ■




## Hand Tools

**John Stortz & Co.**
**210 Vine Street**
**Philadelphia, PA 19106**

*Atop the ship scraper illustrated here sits one of the most interesting tool distributors in the country. Stortz specializes in specialized tools of certain trades (they are strong on masonry and cooperage) and is a place always to check before abandoning hope or seeking the conversational "guess what this is."*

*—putz*

## Plywood Codes

*As our wonderful friends in the lumber business inch closer to the ultimate goal of squeezing blood from trees, the use of plywood becomes ever more complex and fraught with surprise (surprise!) around water. Especially the scrounger must have the coding info, which is all laid out in a free brochure put out by:*

**American Plywood Association**
**P.O. Box 11700**
**Tacoma, WA 98411**

*—putz*

## Sigh

**Oliver Machinery Co.**
**Grand Rapids, MI 49504**

*Boatbuilders face an iron curtain right from the beginning — where to get access to heavy-duty standing shoptools. The large department/catalog outfits have been doing a reasonable job keeping the shopgrade standing tool within reach, but the big stuff, most notably planers and large bandsaws, make inflation at the soda fountain meaningless. And it isn't one of those little clipboard and whistle things that makes life interesting, either. Boatbuilders begin with massive chunks of oak in the round and flitchsawn rough plankstock — miles of it — and only monsters can eat it all. All builders have their own bandsaw acquisition stories to tell, tales of conniving, begging, peculiar trades made (I got mine in a fish house for a rifle), and generally an inordinate amount of frustration for the stage of work it entails. Anyway, an Oliver 36-inch bandsaw sells new today for around $6,500. Sigh.*

*—putz*

**English saws. Left — Tillotson of Sheffield. Right — Ibbotson Peace & Co. Eagle Works. Most comfortable to hold.**

## Antique Woodworking Tools

**(A Guide to the Purchase, Restoration and Use of Old Tools for Today's Shop)**
**Michael Dunbar**
**192 pp., 1977**
**$12.50**
**Hastings House, Pub., Inc.**
**10 East 40th Street**
**New York, NY 10016**

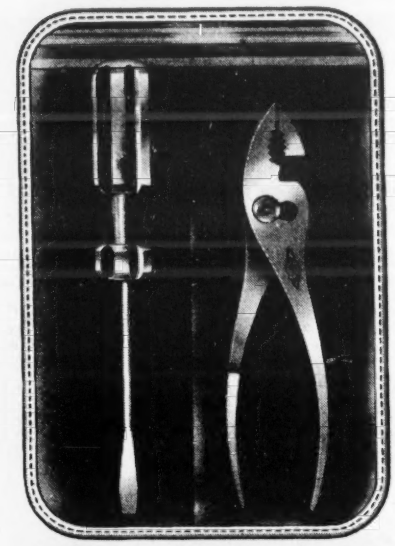
*There are lots of fanatical builders of wooden boats out there, a major portion of whom are building craft to old, classic designs. "We want good boats like the old-timers had," they say, as they rev up the Sears Craftsman circular saw for their joiner work and hog excess wood off their spars with a Rockwell power planer. Michael Dunbar thinks that's pure dumb — that only antique tools should be used to build from antique designs, that power tools and even modern hand tools fail miserably in recreating the "feel" and "look" of the old classics. In* Antique Woodworking Tools, *Dunbar is speaking to the furniture- and cabinet-maker, but his thesis is easily transferable to wooden boat builders. We couldn't agree more and, with Dunbar, call on the restaurant owners and suburbanites of the world to take those antique tools off the wall and use them for real work, not decoration.*

*—spectre*

Besides giving the modern woodworker extremely efficient performance antique hand tools also give him a feeling for his roots. Tradition is not much in the way of a tangible advantage, but it is something that a woodworker can never understate. With the possible exception of chipping flint knives his craft is the oldest known to Man. Many historians accept the eighteenth century as having been Europe's finest hour. But besides being the Age of Reason, the Age of Statesmen, the Age of Enlightenment it was also the Age of Cabinetmakers. If woodworking was not the finest and most sophisticated form of expression of this period it was the most widespread. The most powerful nations produced the best and most capable woodworkers. Thus, the greatness of woodworking lies in its past. The eighteenth century produced dozens of great names that quickly come to mind. The nineteenth century developed fewer famous furniture makers and woodworkers. The twentieth century has failed to offer more than a handful who could even walk tall among the giants of the past.

•

Before a piece of wood could be shaped it had to be made uniform. The gashes left by the saw while cutting the board from the log were quite deep. It was a waste of time to remove only a thin shaving with each pass of the plane and obviously something dramatic was called for. The plane which was used for this purpose had been developed well before the birth of Christ. In fact, if Jesus was indeed a carpenter, he was also faced with the need to remove a thick chip from the surface of rough lumber. The tool which was used was called alternately a jack or a fore plane.

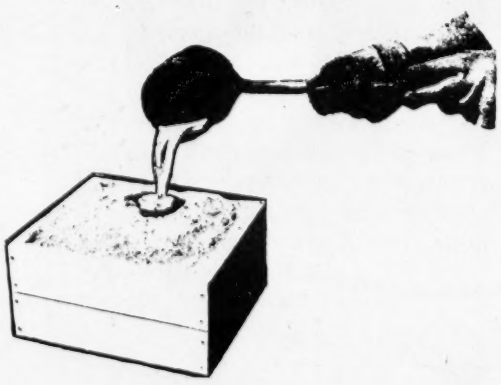


## Safety Tools

**AMPCO Metal**
**P.O. Box 2004**
**Milwaukee, WI 53201**

*A good tool kit on board a boat is, in effect, a gland full of antibodies the boat uses to fight infection. The problem is that a boat tool kit is the second most infection-liable organ aboard (the first is the bloody electrical system). Tool steel rusts horribly. Of the several manufacturers of nonferrous, nonsparking, nonmagnetic (don't have to worry about setting them near the compass), and corrosion-resistant tools, here's AMPCO.*

*—putz*



Pouring a casting in the crucible.
— Pyramid Products Catalog

## Founder's Goods

**Pyramid Products Co.**
**3736 South 7th Ave.**
**Phoenix, AZ 85041**

*Small foundry sets, with casting capability up to fifty pounds of metal (nonferrous). Many boatbuilders we know who took the time to design, patternmake, and cast their own fittings say that it was the most pleasurable and satisfying part of the adventure. The first thing other boatpeople notice on stepping aboard other craft is, "Where did you get THAT?"*

*—putz*

Heller blacksmith's tongs from the makers of the first U.S. anvil, Fisher and Norris.

"Wow," the boy said in a palindromic tone of voice, "I didn't know iron could do that."

"Well, sure, son; metal's just a plastic, you know . . ."

—Fred Brooks to a neighbor's son

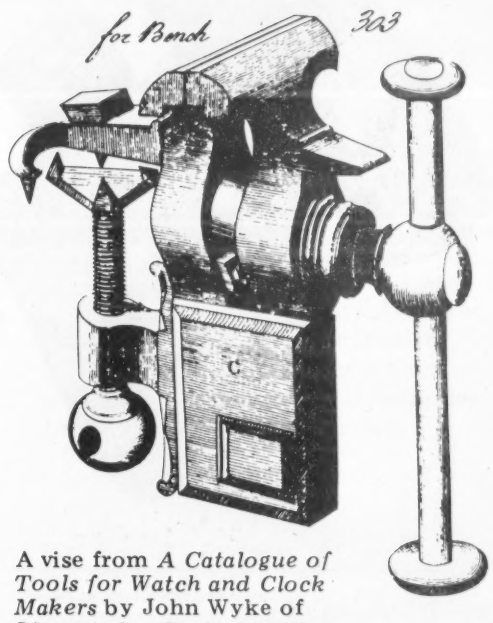
## Forge Supplies

**Fisher & Norris, Inc.**
**301 Monmouth Street**
**P.O. Box 1475**
**Trenton, NJ 08607**

**Kennedy, Foster Co., Inc.**
**855 Bloomfield Ave.**
**Clifton, NJ 07012**

*We are children of the Iron Age and still need a hammer and anvil. The Sears number-two ballpeen, heating with a propane torch and pounding out on the curb or atop the itty-bitty bench vice ain't the way to do it. The best place to scrounge these days is in the neighborhood of old quarrying industries (there used to be a blacksmith for every dozen or so quarrymen because of their tool sharpening requirements) or, of course, in horsey districts. Otherwise, it's buy a forge new. There are a half-dozen forging suppliers in the country, Fisher & Norris and Kennedy, Foster being two of the better known and reliable.*

*—putz*




A vise from *A Catalogue of Tools for Watch and Clock Makers* by John Wyke of Liverpool — *Early American Industries.*

## Early American Industries

**c/o Mrs. P.B. Kebabian**
**11 Scottsdale Road**
**South Burlington, VT 05401**

*The Early American Industries Association as a listing represents both strength and weakness; the former for its aid and abetting the tool freak that boatbuilders tend to become, the latter because associations more and more are becoming the only way many people can get hold of the old traditional tools. Join, correspond, meet people, then — "Oh yeah, you have an extra barking spud? Great, trade you my (sob) blacksmith's swedgeblock for it." They also have some terrific publications about tools, not to mention a film library.*

*—putz*

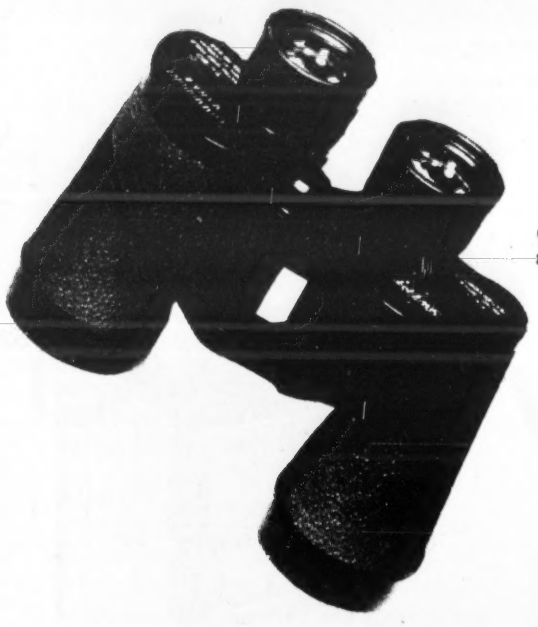
Polythene boots from Defender Industries.

## Defender Industries, Inc.

**Catalog**
**$1.00**
**P.O. Box 820**
**255 Main Street**
**New Rochelle, NY**

*In a decade's time of collecting marine equipment catalogs, to the point where joists and sills creak, we have found few outfits as good and none better for general marine supplies, at bottom dollar and consistent service, than Defender.*

*—putz*



Commodore MK II wide-angle 7 x 50 binoculars — *Spyglass*

## Spyglass

**(Sailboat Rigging Guide and Equipment Manual)**
**384 pp., 1979**
**$4.95**

**Spyglass**
**2415 Mariner Square Drive**
**Alameda, CA 94501**

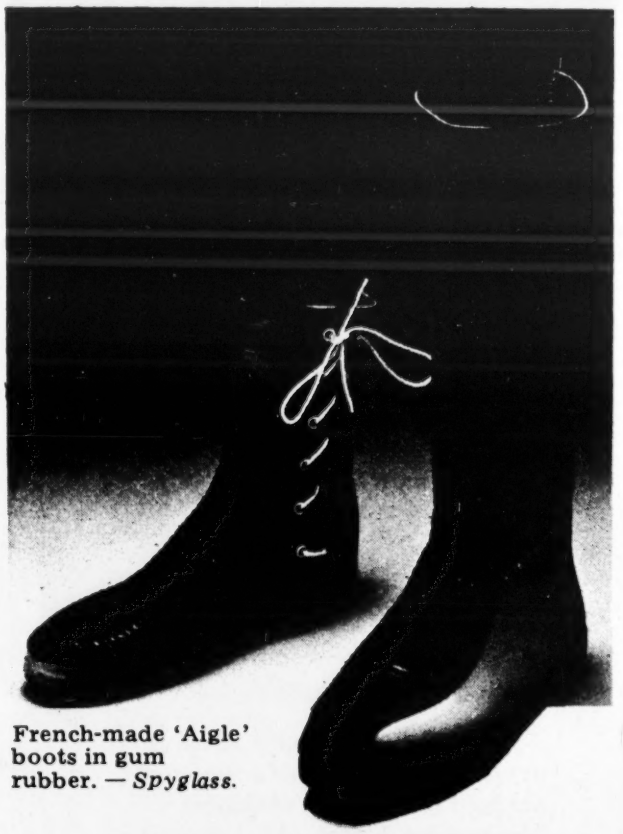
Spyglass *is a reference book listing and describing the foremost name-brand yachting wares in the country. As an equipment reference book it is rather a wealthy person's* Mariner's Catalog. *As literature, it's a good buy, because half the book is narrative on state-of-the-art yachting practice, which can be pooh-poohed only at one's peril. The titanium/stressed-member set have lots of good ideas. Their stuff is slickity topbucks, very desirable, out of reach to our good friends.*

*—putz*

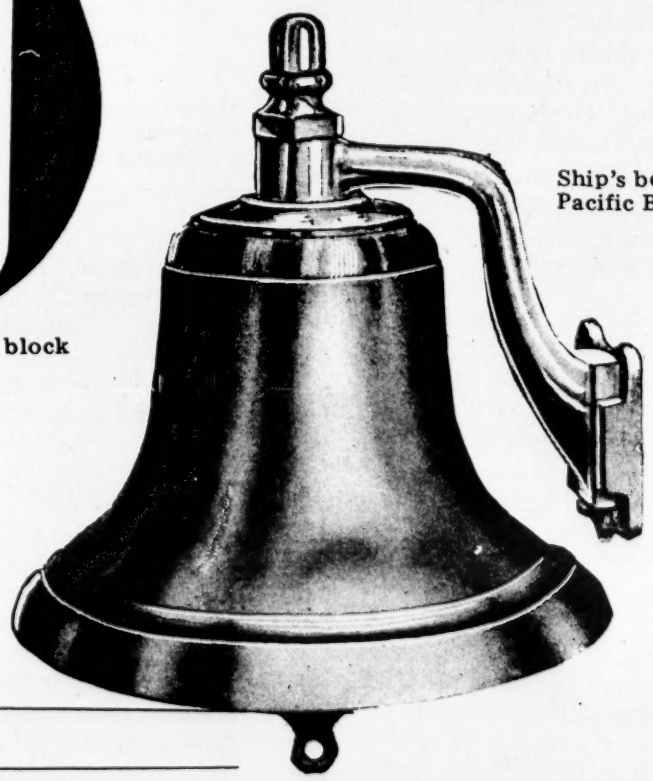
Mast Trim

There are two schools of thought concerning the question of how to flatten and depower the mainsail. One school advocates bending the mast as the wind increases. The other school believes that it is equally efficient to keep the same bend in the spar, and to flatten the main using only the cunningham and the flattening reef. I favor the latter method. I have two reasons for this. If you bend a spar very much in an increasing wind, you lose forestay tension. A tight forestay enables the foresail to maintain a proper shape with increasing wind velocity, so that the boat will sail closer to the wind. If you want to keep the same forestay tension, you must use a bigger mast section, and then you get more wind resistance. My second reason is that, if you bend your spar, you must have crew that know exactly what they are doing, to avoid mast failure.

Soft shell snatch block — *Spyglass.*



French-made 'Aigle' boots in gum rubber. — *Spyglass.*



Ship's bell from Pacific Bronze

## Nonferrous

**Pacific Bronze Co., Ltd.**
**1616 Pandora Street**
**Vancouver, B.C.**
**V5L 1L6**
**Canada**

*(Cannon ball holders !, etc.)*

**Rostand Marine Hardware Mfg. Co.**
**33 Railroad Ave.**
**Milford, CT 06460**

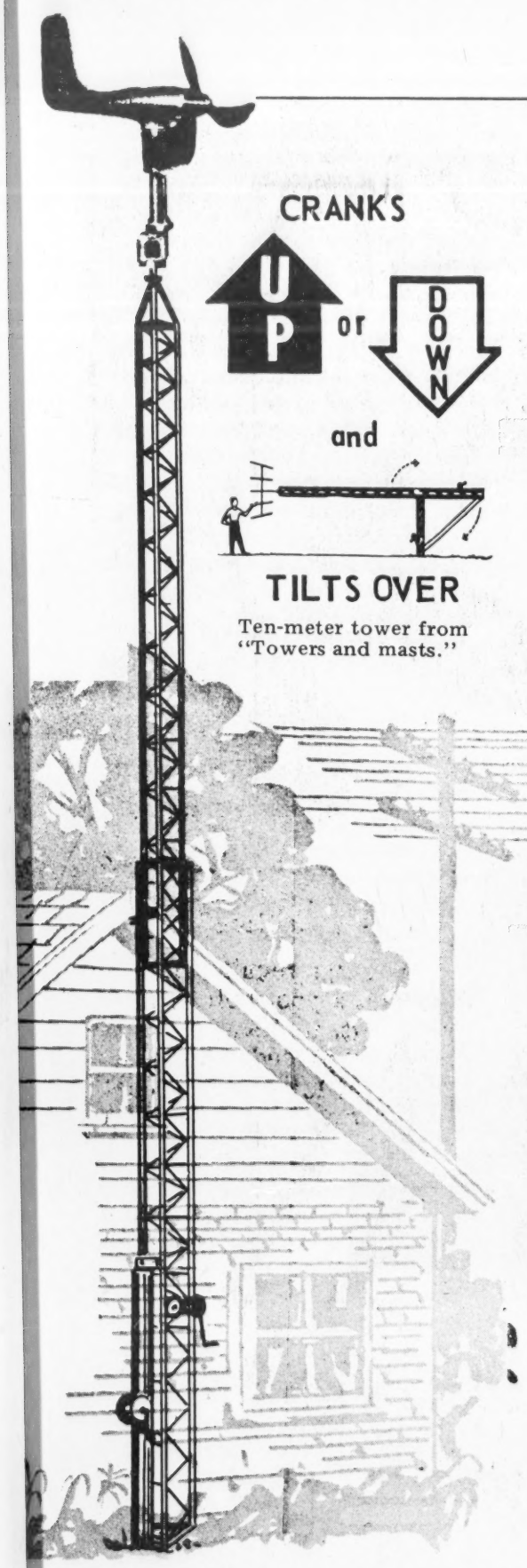
*(Elder gents who remember and refuse to quit.)*

**Lunenburg Foundry & Engineering Ltd.**
**Lunenburg, Nova Scotia**
**Canada**

*(Easily the saltiest old-time gear factory in North America.)*

*Bronze, brass, and copper were the marine metals of choice for centuries. Stainless steel, aluminum, monel, marinium, and the synthetics have largely supplanted these ignoble but beautiful metals, and it's too bad. There are still a few manufacturers around to supply the holdout owners owners, designers, and builders who call for the nonferrous stuff, but they are a shadow of their former selves, old veterans who every year find themselves in reduced company. There is something in the holding of a big bronze fitting that mixes beauty and trust. Nice. A few places to check-out.*

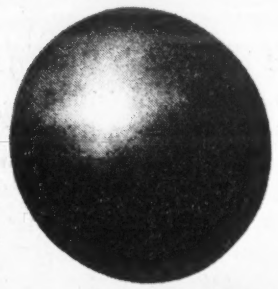
*—putz*




Ten-meter tower from "Towers and masts."

Illustrations from various sections of Science Associates Series 9 catalog.

Meteorological balloons — "Upper Air and Visibility."



British Meteorological Office, sunshine duration recorder from "Solar Radiation."

Remote transmitting rain and snow gauge from "Precipitation Hydrology."

Lunenberg steerer from Lunenberg Foundry

## Davis Instruments Corp.

**P.O. Box 3157**
**San Leandro, CA 94578**

*Begin small, stay simple, offer lots for little. Years ago Davis listened to* The Graduate's *homely advice and went into plastics, developing and manufacturing nautical gear and accouterments of plain, solid design and low cost, six dozen or so; range and direction finders, speedometers, sextants, and other navigational aids, wind indicators, spar and rig fittings — all kinds of stuff. Something for the boat on its birthday.* —*putz*

## Science Associates

**230 Nassau Street**
**Princeton, NJ 08540**

*Science Associates is the best place in the United States for weather and climatological instruments. They have at least a dozen kinds of every instrument to measure anything in the atmosphere that we to date know to be there. Tell them the level of your interest, or you'll make them waste our precious national resources through sheer brochure-power.*

—*putz*

## Brass Polish

**Jerome W. Hubert**
**18714 N.E. Halsey**
**Portland, OR 97230**

*Polishing up the handle on the big front door may make you admiral of the queen's navy, but it can also make you hootibats if you place pride of ownership alongside being able to count your teeth in the brass. If you have suspected that museums and antique boat or car owners have a secret on how to polish the stuff and keep it that way, you are correct. Brass Protective Coat.*

—*putz*

Dear Eds:

Regarding your question re: waterproof matches in *Mariner's Catalog 5,* page 130.

I have used the matches (box cover enclosed) for years while camping under all types of weather, without a failure.

As far as I know, Coghlan's Ltd. of Winnipeg, Canada are sole distributors (wholesale) for North America. I believe there is also a windproof/waterproof version of these matches.

A letter to them would probably uncover local distributors.

Sincerely,

Roger Cole

## Steam Coasters and Short Sea Traders

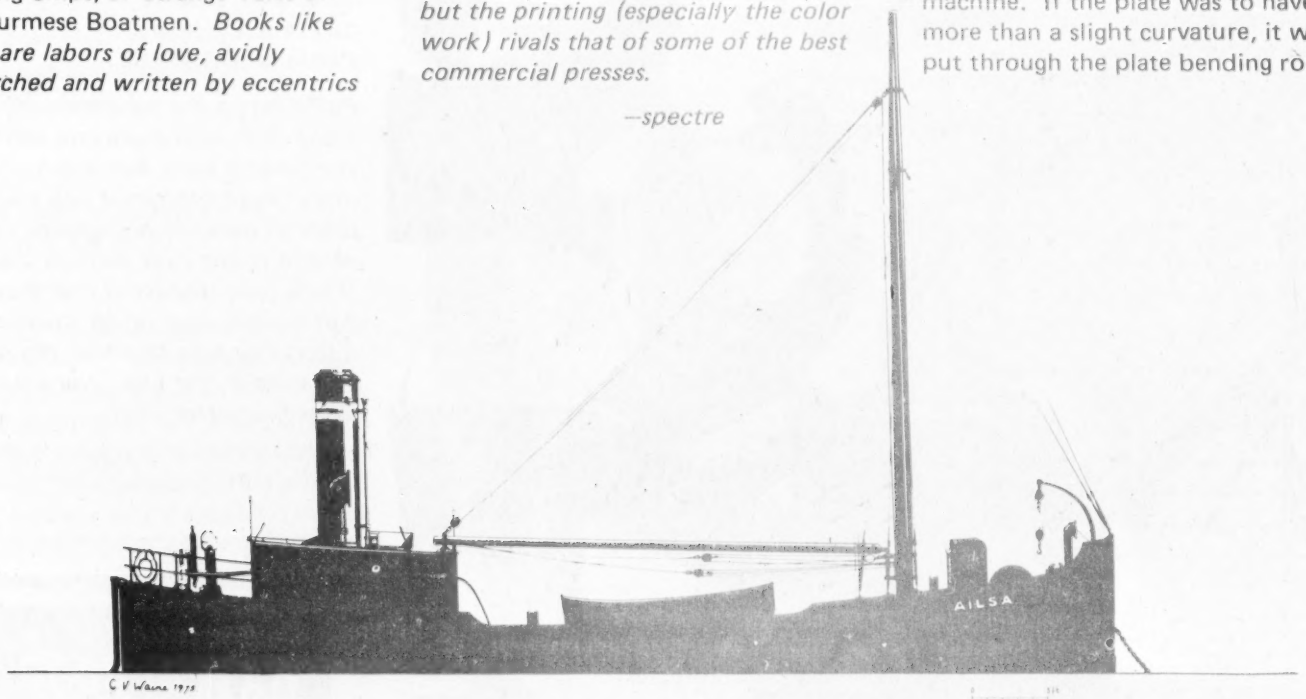
**Charles V. Waine**
**152 pp., 1977**
**£7.95**
**Waine Research Publications**
**Mount Pleasant**
**Beamish Lane**
**Albrighton**
**Nr. Wolverhampton**
**WV7 3JJ**
**England**

*Nautical literature, like any other genre, has its share of esoterica. Without looking very hard you can find books with titles like* The Sailing Canoes of the Outer Fijis, *or* Futtock Construction in Dutch Trading Ships, *or* Strange Tales of the Burmese Boatmen. *Books like these are labors of love, avidly researched and written by eccentrics with mismatched socks or academics with compulsory sabbaticals to justify. Many of them are useless to all but a few people of like mind, but some are marvelous works of both art and intellect.*

*One of the best I have seen in years is* Steam Coasters and Short Sea Traders. *A study of certain coasting craft of England, this book has all of the elements of a great work on a narrow subject — knowledgeable writing, detailed explanatory diagrams, and fantastic drawings. Besides, the book is a monument to individual enterprise; the author wrote the text, set the type, drew the diagrams, did all the camera work, and printed the book on his own press in his garage. The design of the book isn't great, but the printing (especially the color work) rivals that of some of the best commercial presses.*

*—spectre*

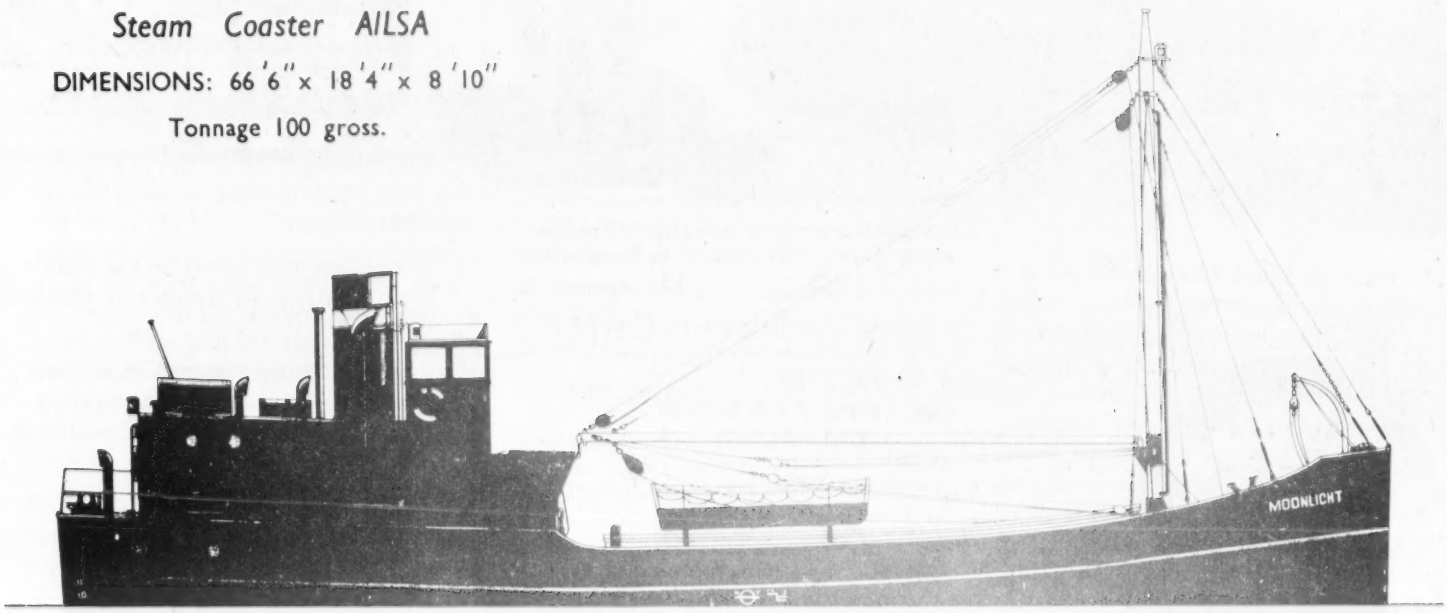
Plates were prepared by rolling them with flattening rolls if required, then the appropriate template from the mould loft was used to mark out the edges of the plate and the rivet holes. The plates were then lifted by a small crane on to the shearing and hole punching machine. The shears were then used to cut the plate to size. The shears and punch could make up to thirty-five strokes per minute on some machines, and so operators had to be very agile moving the plate as they had less than two seconds to arrange the next cut, or move it on to the next hole to be punched. About 80,000 rivet holes were required for a coaster of 500 gross tons. The plate edges were later smoothed off using an edge-planing machine. If the plate was to have more than a slight curvature, it was put through the plate bending rolls.




*Steam Coaster AILSA*

DIMENSIONS: 66'6" x 18'4" x 8'10"

Tonnage 100 gross.




*Steam Coaster MOONLIGHT*

DIMENSIONS: 85'6" x 19'6" x 10'0"

Tonnage 164 gross.

COMPLETED in 1952 by W. J. Yarwood & Sons, Ltd., Northwich, for the Light Shipping Co., Ltd., managed by Ross & Marshall Ltd., Greenock, MOONLIGHT was one of the few 'puffer' type vessels to be built outside Scotland for the Western Isles trade with dimensions suitable for the Crinan Canal. In 1966 she was sold to A. H. Turner. After being laid up at Troon for a number of years she was broken up in 1970.

## Taking a Crack at It

**Sailing Illustrated**
**Patrick M. Royce**
**345 pp.,**
**$5.50**
**Royce Publications**
**Box 1967**
**Newport Beach, CA 92663**

**Hand Reef & Steer**
**Richard Henderson**
**95 pp., 1965, 1978**
**$4.95**
**Contemporary Books, Inc.**
**180 N. Michigan Ave.**
**Chicago, IL 60601**

*Entirely different sorts of books designed to do the same thing — introduce readers to boats and sailing. Probably Royce has taught more people to sail than any other book, and its jam-packed paperback fit-the-hand format, just begging to be taken and kept aboard, shows why. It has a quick-reference thumb index that works, and the emphasis is on showing the procedures rather than talking about them. Good keepaboard fare.*

*Henderson is a keepathome; elegantly illustrated, very methodical, the emphasis is on honing skills as much as learning them. Advanced sailors can profit from this one as much as novitiates. With Glenans, Chapman, Royce and Henderson, you're covered, though it would probably enhance your experience to have a boat and go sailing in it.*

*—putz*

## Sailmaking Goods

**Howe & Bainbridge, Inc.**
**(Home office)**
**220 Commerical Street**
**Boston, MA 02109**

**also:**

**816 Production Place**
**Newport Beach, CA 92663**

**14970 N.E. 31st Circle**
**Redmond, WA 98052**

**1218 West 55th Place**
**Countryside, IL 60525**

*Soft-tech in the form of cloth structures has been a feature here for years. Boats are full of it in the form of covers, mastcoats, buckets, stowage aids, and, of course, sails. Howe & Bainbridge is among the most respected suppliers of sail-maker's hardware and supplies. Write for catalog and price list.*

*—putz*

## Control your pitch.

—Fred Brooks, at a sales convention

**WaterMota Ltd.**
**Abbotskerswell**
**Newton Abbot**
**South Devon TQ12 5NF**
**England**

*Efforts to save on energy use is partly a matter of saving on moving weight, and boats are no different. Marine engine transmissions (reverse gears) are heavy, take up precious space, and reduce efficiency. Reversing and controllable-pitch propellers are the future. WaterMota in England makes the smallest and least expensive one currently available.*

*—putz*

## Hydrocharger

**Regent Marine and Instrumentation**
**1051 Clinton Street**
**Buffalo, New York 14206**

*Wind-driven trickle-chargers for keeping boat batteries up to snuff have become quite common, and of course are desirable for boats that live at their moorings or slips for long periods. But for those who keep moving, the advantage of a material 700 times denser than air can be tapped with a Hydrocharger.*

*—putz*

## Soapstone

**Vermont Soapstone Company**
**Perkinsville, VT 05151**

*By now most of the old woodstoves that were going begging ten years ago have been scarfed up to become their owner's warmth and joy, not to mention New Age brag. And there have arisen a host of new manufacturers and importers to feed BTU munchies now and in perpetuity, for lots of money, and even then the art of iron casting is not up to what used to be available, all the pretty ceramic notwithstanding. The best stove material always was and remains* soapstone. *Vermont Soapstone Company earns their bread and butter selling griddles, bunbaskets, warmers, boot driers, and like, but they also offer flat stock 1¼-inches thick at $19.80 a square foot. With it and your own angle iron, drilling, and bolting, you can make the best stoves available to your own specs, including small ones for boats. Indeed, Paul Luke in Boothbay, Maine, still offers boatstoves in this material. They throw heat for hours after the fire dies, and so are especially good for stoves in small sizes.*

*—putz*

## The New Glénans Sailing Manual

**James MacGibbon &**
**Stanley Caldwell, Eds.**
**782 pp., 1972, 1978**
**$24.95**
**W. W. Norton & Co., Inc.**
**500 Fifth Avenue.**
**New York, NY 10036**
or Whole Earth

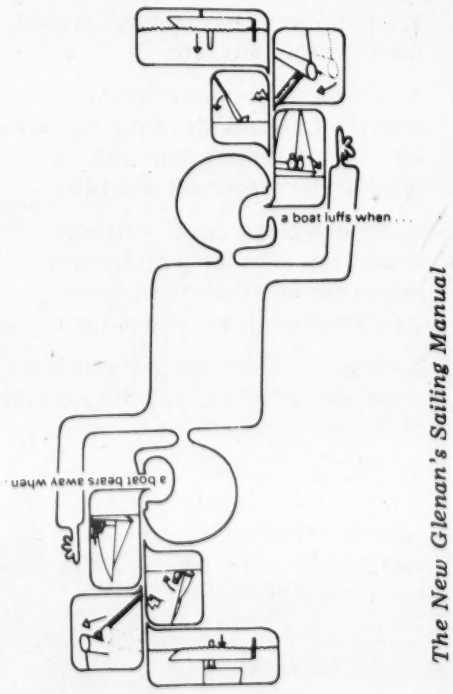
*From France and years of training experience at The Glénans Sailing Center comes a text so comprehensive and graphic it serves as an example of what "comprehensive" really means. You start with a tiny dinghy ("If there is an instructor around, he should look the other way. At all costs he should not shout advice ...") and advance by skills to serious passage making. Typical skill: spinnaker handling: twenty pages.*

*—SB*

There are several ways of making a boat luff up or bear away without a rudder, which can either be adopted at one and the same time or separately. They have already been explained, but they are worth repeating here. *A boat luffs up when she heels, when the mainsail is sheeted in, when the centreboard is fully lowered or when she is down by the head.*

*A boat bears away when she heels to windward, when the mainsail is eased, when the centreboard is raised, even partially, or when she is down by the stern.*

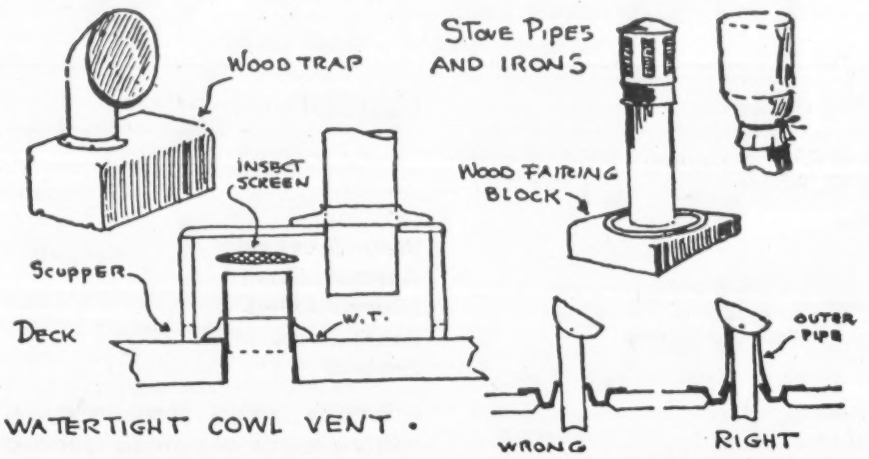
*Speed is an influential factor. The faster a boat goes the more weather helm she carries. If she is going slowly, she may develop some lee helm (more likely still if she goes astern).*




*The New Glenan's Sailing Manual*

## Boatowner's Sheet Anchor

**(A Practical Guide to Fitting Out, Upkeep, and Alteration of the Small Wooden Yacht)**
**Carl D. Lane**
**304 pp., 1941**
**$3.50**
**Hawthorne Books, Inc.**
**260 Madison Ave.**
**New York, NY 10016**
or Whole Earth




Boatowner's Sheet Anchor

*As much as we like to make fun of it as a hopeless cliche, saltiness plays a large part in the proper seagoing experience. Restaurant owners have known this for years, so the most popular seafood spots, for instance, are draped with nets and floats and brass binnacles and all manner of nautical gewgaws. But they miss the point, you see, because saltiness isn't a matter of material goods at all. Rather it's having the right frame of mind (No, dear, it is not yelling "Avast, matey" every twenty seconds, either). Carl Lane has the right frame of mind, and his* Boatowner's Sheet Anchor *is the perfect little guide to managing a small boat — power or sail — so that no one will ever be able to accuse you of being crass or of overdoing a good thing. The advice is practical and the instructions are concise and worth following. Much has happened in the boat world since 1941, so the information is only applicable to wooden boats of traditional design and build.*

*—spectre*

The ideal deck should have at least the following essential features:

1. Room to work under all conditions of weather, angle of keel, and light conditions (at masts, winches, power plant, tiller, wheel, etc.).

2. A minimum of openings, trunks, hatches, skylights, etc.

3. All these features concentrated near the fore-and-aft center line and aft of the foremost mast and forward of the mainsheet and tiller.

4. Smoke pipes, cowl ventilators, and similar fair-weather protuberances removable and their deck openings capable of being sealed sea-tight.

5. A space for the dinghy which will in no way interfere with the working of the ship or docking.

6. Lounging space for the crew which is comfortable, dry, and capable of being covered by an awning or a boom tarp, or which has a permanent roof.

7. A minimum of deck hardware, sheets, fair-leads, etc.

## Disease

**Dept. of HEW**
**Public Health Service**
**Center for Disease Control**
**Bureau of Epidemiology**
**Quarantine Division**
**Atlanta, GA 30333**

*Many of our paranoid friends like daily to inventory the current activities of the Four Horsemen of the Apocalypse to avoid being caught suddenly unawares. You'll recall that one of the horsemen's fun number is* Disease, *and that most of the really fun diseases in history were transported to their place of special devastation by ship (the Black Death that killed half of Europe arrived via a Genoese galley). Well, HEW boards ships each month and inspects them, issuing a monthly report that you can get. Ships fail with an 84 or under, which you'll remember as being a B-minus.*

*—putz*

## Hiscock

**Voyaging Under Sail**
**Eric C. Hiscock**
**315 pp., 1970**
**$17.95**

**Cruising Under Sail**
**Eric C. Hiscock**
**468 pp., 1950, 1965**
**$22.50**

**both from:**
**Oxford University Press**
**16-00 Pollitt Drive**
**Fair Lawn, NJ 07410**
or Whole Earth

*The hardcore budgeteers in the* CQ *readership must chaff whenever they see a book called essential or "must reading," but dammit you can't know too much about a boat at sea if you're going to be on one. Hiscock has spent his entire adult life on them (three boats of his own named* Wanderer*), sailed all seas, and kept his eyes, mind, and friendship open the whole while. His books are technically complete, redolent with examples, and filled with the blood of shared experiences — at least half his wisdom comes from the next boat over. Which is another thing: there is a kind of fifth world out there sailing, a populous, mobile society making the world its neighborhood and with the selfconsciousness and gossip (from the German for God's family) to cover it all.*

*—putz*

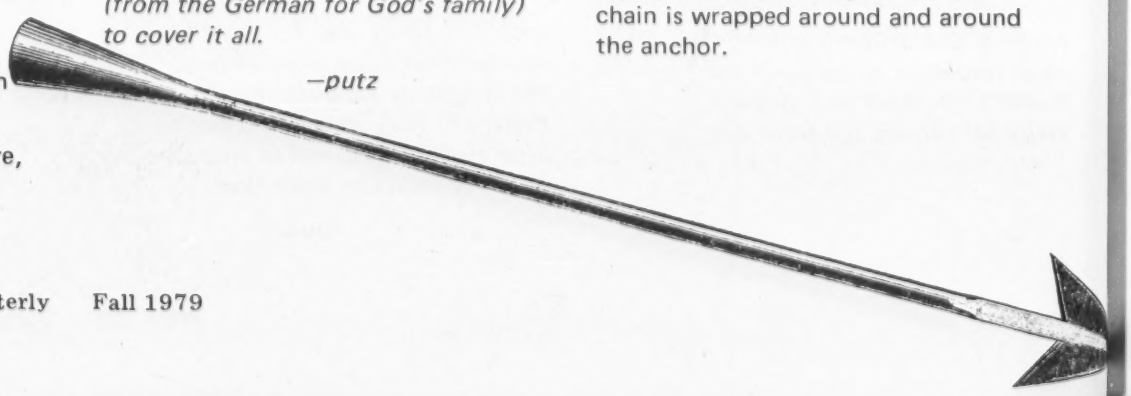
## After 50,000 Miles

**Hal Roth**
**329 pp., 1977**
**$12.95**
**W.W. Norton & Co., Inc.**
**500 Fifth Ave.**
**New York, NY 10036**

*Anybody who has cruised 50,000 miles, especially if that distance has included some of the most treacherous waters of the world, deserves to be heard. Hal Roth has voyaged that far and more, and his book of collected advice for would-be deepwater cruisers is as useful as Hiscock's, perhaps even more so because Roth's experience is more recent.*

*—spectre*

Something new in ground tackle is this Wishbone anchor, which went into production Florida in 1976. Designed by Jim Taylor after much experimentation in the Bahamas, this stockless anchor is quite non-fouling and appears to dig deeply and firmly in good holding ground. In one series of tests where Danforths, CQRs CQRs and Wishbones were dragged behind an automobile on a dirt road, the Wishbone stopped the car every time while the other anchors dragged merrily along the top of the road. Because the Wishbone has no stock, it is non-fouling even if the chain is wrapped around and around the anchor.



## The Craft of Sail

**(A Primer of Sailing)**
**Jan Adkins**
**64 pp., 1973**
**$6.95**
**Walker and Company**
**720 Fifth Avenue**
**New York, NY 10019**
or Whole Earth

*There are thousands of introductory books for sale today on sailing. Most are adequate, but almost all fail in one respect – getting across to the reader the dynamics of sailing; i.e., how in sweet gypsum do you get from here to there under sail if the wind is blowing straight into your teeth? One book that does not fail; in fact, one book that makes theory incredibly simple, is Jan Adkins'* The Craft of Sail. *There is none better.*

*–spectre*

## Sea Survival

**Dougal Robertson**
**148 pp., 1975**
**$12.95**
**Peter Elek, Inc.**
**99 Main Street**
**Salem, NH 03079**
or Whole Earth

*There are many books and manuals on safety at sea and sea survival in the event of an accident. Almost all books on general sailing or boat handling have a chapter on the subject. Certainly these books and chapters have their value, but compared to Robertson they all pale, because Robertson has been there. He spent days on end in a liferaft after a catastrophe at sea. When he sat down to write this book, he didn't mess around! Every aspect of physical, mental, and emotional survival is here in detail and supported by example and often anecdote. If you take any boat onto any ocean, take this book with you. Inside the back cover are drift and weather charts, shipping lane charts, maps of occupied shorelines, and other arduously friendly dope.*

*–putz*

## Piloting, Seamanship and Small Boat Handling

**Charles F. Chapman**
**640 pp., 1975**
**$11.95**
**Hearst Books**
**P.O. Box 1406**
**Radio City Station**
**New York, NY 10019**
or Whole Earth

*For reference on board, many swear by Royce's* Sailing Illustrated. *I swear at it and stick by "Chapman's," the familiar term for this book which indicates its vast popularity. In print since 1922, now in its 51st edition, this is the only available one-volume complete introduction to running a boat – from its excellent intro to nautical terminology through navigation, rules of the road, flag bloody etiquette, weather, electronics, boat trailering, the whole wet gamut. That it is not at all restricted to sailboats helps broaden and inform the otherwise narrow windblown mind.*

*–SB*

Illustration by Jan Adkins
*– The Craft of Sail*

Man-Overboard drill should be practiced over and over in every wind, on every point of sail, until the easy retrieval of fallen crew members, blown hats, dropped jackets, and other flotsam, becomes a natural reflex.

# man·overboard

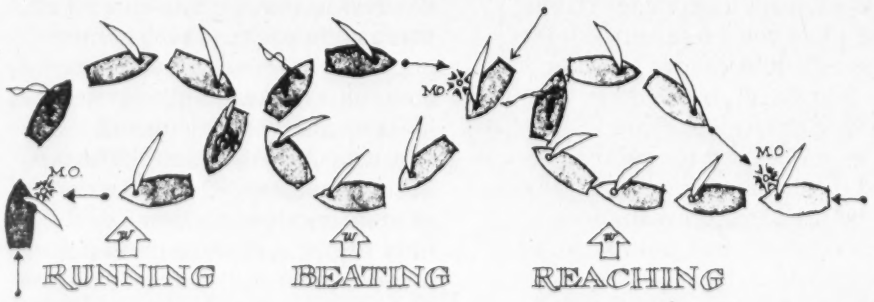
"Stand by to gybe!"

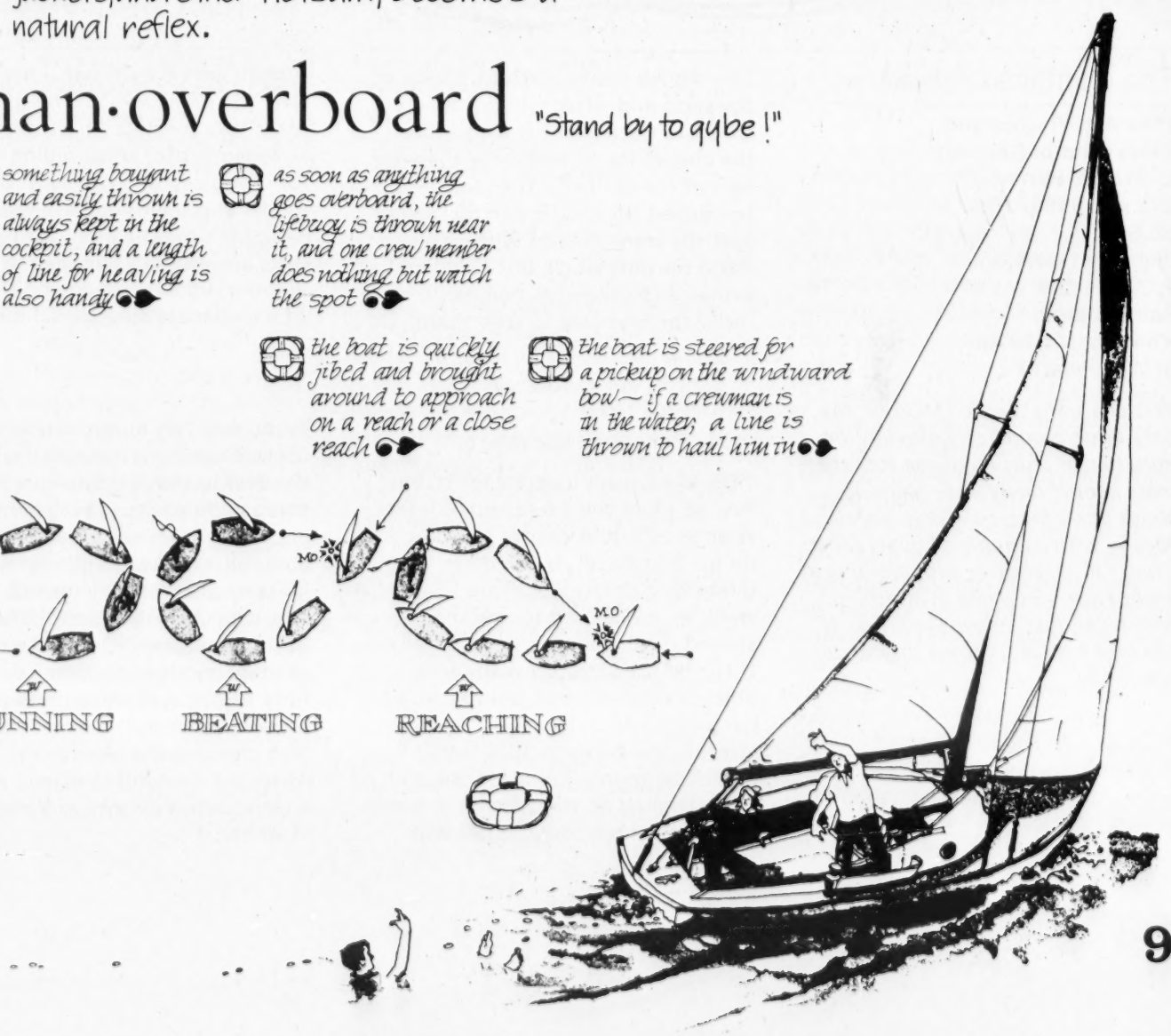
something bouyant and easily thrown is always kept in the cockpit, and a length of line for heaving is also handy

as soon as anything goes overboard, the lifebuoy is thrown near it, and one crew member does nothing but watch the spot

the boat is quickly jibed and brought around to approach on a reach or a close reach

the boat is steered for a pickup on the windward bow – if a crewman is in the water, a line is thrown to haul him in



## Knots and Lines

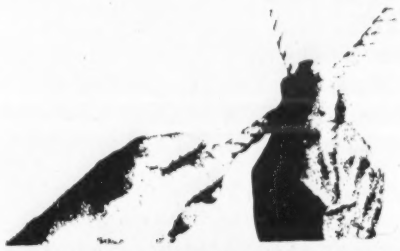
**(Illustrated)**
**Paul & Arthur Snyder**
**104 pp., 1967, 1970**
**$7.95**
**John de Graff, Inc.**
**Clinton Corners, NY 12514**
or Whole Earth

*The reason this is far the best introductory nautical knot book is that it teaches your* hands *(rather than just your eye) how to make knots, and everything in the book is in reference to use on a boat. Photographs of the tier's hands from the tier's point of view do the trick. Who would have thought the invaluable if complex "constrictor knot" could be made by dropping two twisted loops over the item to be constricted instead of by elaborate weaving?*

*—SB*

How hands make a "carrick bend." The best knot for connecting two lines. (Forget the square knot — it's worthless.)

1



2

3

4

5

6

## The Compleat Cruiser

**(The Art, Practice and Enjoyment of Boating)**
**L. Francis Herreshoff**
**372 pp., 1956, 1972**
**$8.50**
**Sheridan House, Inc.**
**P.O. Box 254**
**South Station**
**Yonkers, NY 10705**
or Whole Earth

*This charming classic (1956) is the only book around on enjoying the minutiae of cruising of the sort that most people really do — gadding about one's local bays and islands, ideally with a couple of boats separating for adventures and rejoining at anchorages, indulging in anything-goes races, just messing around. It can be a high art, proves this aristocratic tale.*

*—SB*

The dinghy had an oarlock socket at the stern and, after sailing a way, Goddard slacked the sheet so that the dinghy lay to with only the after part of the sail full. Then he unshipped the rudder and put an oar over the stern to steer with. This made the girls laugh, but Goddard explained to them that an oar was really the best way to steer many small boats and that most life boats and whale boats of the past were steered with oars.

"Why?" inquired both the girls.

"There are many reasons for it, but first of all an oar is a scientific lever arrangement that cannot be improved on for simplicity. It can do several things that the rudder cannot do well. It can be used to row the stern around if the craft is moving slowly. It can be used to scull with, or to pole on bottom. But, best of all, an oar properly handled is a powerful lever that will keep a boat from broaching-to in a following sea, and when landing on the beach it is nearly foolproof. I suppose the last two reasons are why the oar is used to steer life boats and surf boats. An oar is very much the best steering arrangement for small sailing tenders, for if you can do away with the rudder and tiller you have made a desirable simplification, for these parts are always a nuisance to store, and the rudders hanging on the stern of a tender are a perpetual nuisance."

•

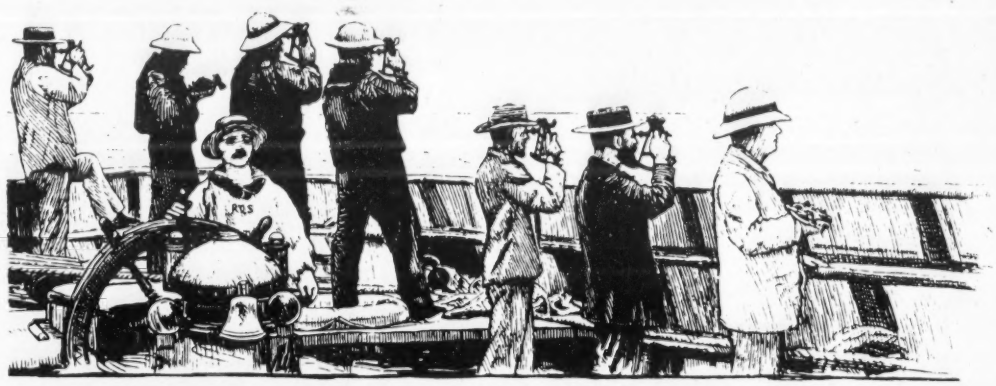
After they had moved out into the cockpit again the sun was drying up the dew so that Weldon hurried as much as he could, wiping off the brightwork, while Jim, who was now fully awake, asked him why he liked to chamois the morning dew so much. He explained: "The dew has been settling on the brightwork all night and has softened up the films of dirt, salt and gum that are on the surface of the varnish." Weldon then chamoised a place in the shade where the dew still remained and it came out as smooth as a piece of amber.

## Navigation, Step by Step

**Coastal Navigation Step by Step**
**Warren Norville**
**203 pp., 1975**
**$15**

**Celestial Navigation Step by Step**
**Warren Norville**
**157 pp., 1973**
**$12.50**

**both from:**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth



Junior officers taking the noon sight

*Of all the nautical sciences, navigation comes across as one part practical and three parts occult. Perhaps this is because offshore navigation depends on the observation of celestial bodies, calling to mind the Zodiac and associated intergalactic drivel. Or perhaps because the authors of navigation texts make the subject so complicated and difficult to understand that the reader comes to believe only Merlin could figure it out.*

*There are scores of navigation books in print today. As far as I can see, they can be divided into two neat categories — those that teach both theory and practice, and those that try to simplify things by teaching practice alone. Being a person who believes that understanding the why is as important as understanding the how, I don't think much of the simplified books. What I do like are books that teach me to* think *my way through a problem. Two that do that are* Coastal Navigation Step by Step *and* Celestial Navigation Step by Step *(the former covers inshore navigation; the latter covers the offshore variety). Both are filled with examples and problems, with solutions, and are written with style, which is unusual for this type of book.*

*—spectre*

The most fundamental idea a navigator must understand is the relationship of time to longitude. Longitude and time have been the Waterloo of many would-be navigators. This need not be if you will just consider hours, minutes, and seconds of time as another system of measuring circles and sectors of circles that can be substituted for degrees, minutes and seconds of arc. Just as you can measure distances on the earth's surface in miles, yards, and feet you can also measure them in kilometers, meters, and centimeters.

## Give Us a Break

We could be humble and skip the self-promotion, but our livings must be made. All volumes of the *Mariner's Catalog* are in print, so if you like what you see here (just a sampling), you could very well like what you see there:

**The Mariner's Catalog**
**Edited by George Putz and**
**Peter H. Spectre**
**Each 192 pages, paperbound, index**
**Vol. 1, $4.95; Vol. 2, $4.95; Vol. 3, $5.95; Vol. 4, $6.95; Vol. 5, $7.95; Vol. 6, $7.95, Vol. 7, $8.95**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

These volumes cover every aspect of the sea, boats, ships, and things in, around, on, under, and over them. Boatbuilding, materials, tools, marine biology and all its subdivisions and related sciences, maritime history and ethnography, ship and boat equipment and gear, specialized topics such as marine mammals, books of the sea for children, coverage of all marine book and magazine publishers in the English-speaking world, marine museums, collections (and collecting), lighthouses, marine model building, shoreline legislation, folklore, arts, crafts, in short, the works.

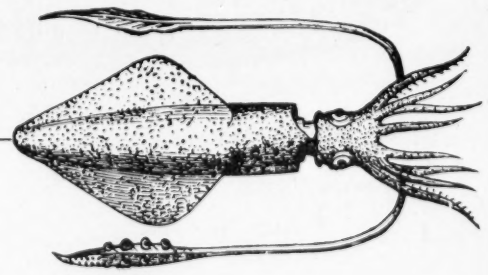
—Eds.

## Maintenance

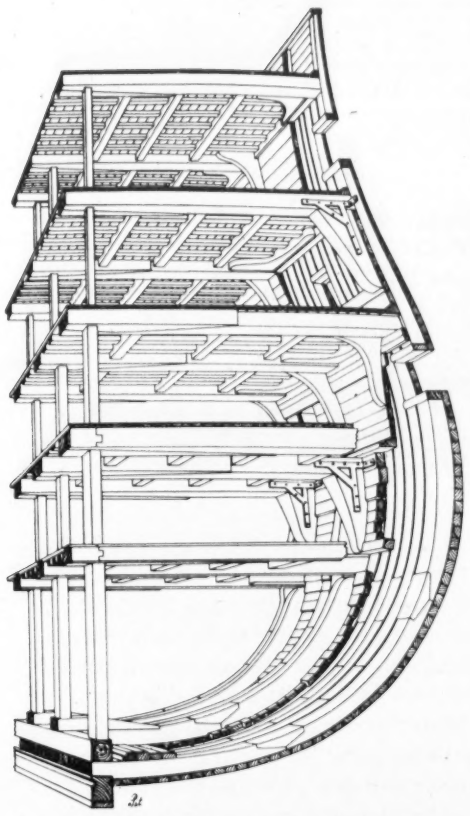
**Time-Life Books, Editors**
**176 pp., 1975**
**$14.60**
**Time-Life Books**
**Little, Brown & Co., Inc.**
**200 West Street**
**Waltham, MA 02154**
or Whole Earth

*Far more than for a car, a house, or a body, maintenance is required for a boat. Use eats boats, disuse eats boats, and water, both fresh and salt, eats boats with relish. They don't tell you that, and books on boat maintenance tend to be feeble, leaving three choices: turn it all over expensively to the yard, learn personally from an expert, or let the boat dissolve. This surprising book presents an alternative learning source (surprising because it's the only excellent volume in an otherwise wretchedly overwrought, overpriced series from Time-Life). It's pretty comprehensive, splendidly clear, and most important, gives the beginner confidence to begin.*

*—SB*



The second phase of laying up is to protect the boat's permanent fixtures. Wash with fresh water and lubricate all fittings that have moving parts. Oil all hinges, and apply a film of petroleum jelly to any exposed hardware likely to corrode. Find out the yard's policy on fuel tanks: some yards require that tanks be topped off to prevent condensation; others, wary of the fire hazard, want the tanks totally drained. Drain or pump out old, acidic engine oil and replace it with fresh oil. In cold climates, pump antifreeze into the engine's cooling system to avert burst piping. Remove batteries, store them in a warm, dry place and keep them from going dead with "trickle charges" of steady low-voltage current. Most yards will do the latter; but it can be handled at home by purchasing a small charger that can be attached to the battery and plugged into a wall socket.



Decks; the intricacies of shipbuilding

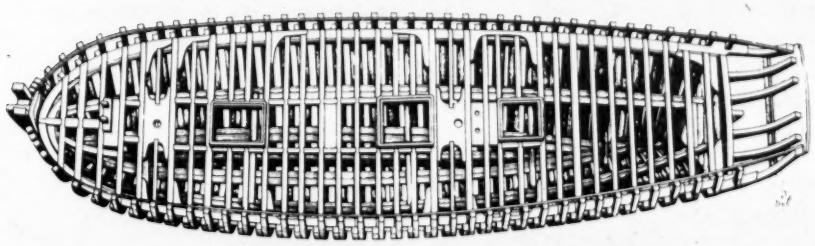
## Modelling the Brig-of-War "Irene"

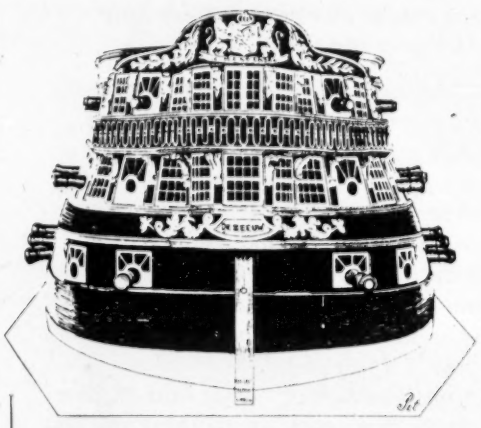
**(A Handbook for the Building of Historical Ship-Models)**
**E.W. Petrejus**
**287 pp., 1970**
**try British Book Centre** *(see p. 77)*

*This book sat on my shelf for a couple of years before I realized what a treasure it is. It was given to me with a bunch of other books, and because I have little interest in ship modelling, I never bothered to crack the covers. Then one day in the course of idle conversation, Putz made the sweeping generalization that* Modeling the Brig-of-War "Irene" *was the greatest nautical book ever published. "You don't say," I shot back, thinking all the while of some great books of my own choice —* Ships and Memories, Sailing Alone Around the World, The Magic of the Swatchways, *etc. "Don't get starry-eyed with me," said Putz, "Just read it."*

*Which I did. I found it to be a magnificent book, if not the greatest nautical book of all time, at least one of the greatest. The author is the former curator of the Prins Hendrik Museum in Rotterdam, the Netherlands, and he has his ship details down cold. Though the book is specifically about the brig* Irene *(1806-1822), it is generally about sailing ships of the period 1795-1825. It is for modellers, ship enthusiasts, and historians, and it tells you not only how things were built and used on ships of the period, but also what life and customs at sea were like at the time. Nobody — and I mean nobody — can draw ships with the clarity and accuracy of Petrejus. Nobody understands perspective and depth the way he does. Nobody can provide so much detail about a single period in maritime history in such a small space as he can. Petrejus is a genius;* Modelling the Brig-of-War "Irene" *is a knockout.*

*-spectre*





Above, Deck of "Lexington," 1775.
Below, Dutch whaler, unloading, 1780.
Right, Stern of Dutch 92-gun "DeZeeuw," 1820.

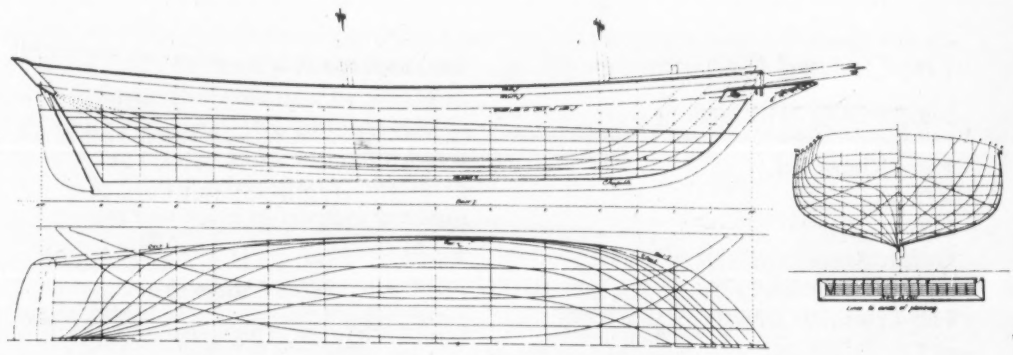
## The National Watercraft Collection

**(Second Edition)**
**Howard I. Chapelle**
**399 pp., 1976**
**$20**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

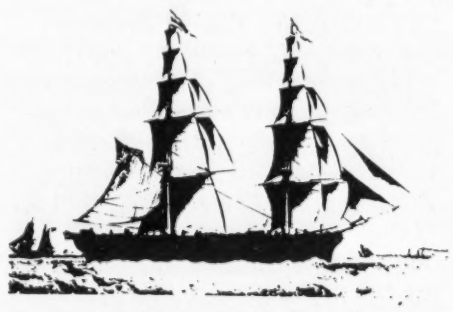
*The Smithsonian Institution is our national treasure. The National Watercraft Collection at the Smithsonian is our national maritime treasure. The core of the collection is made up of half models and rigged models, and represents most of the major and many of the minor ship and boat types of America's past. Whether you have seen the models or not, the catalog of the collection is one of those must-have books for maritime-history enthusiasts. It is at once the description of the models at the Smithsonian and a history of the development of maritime commerce in the United States.*

*—spectre*

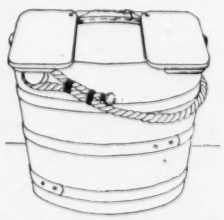
The half-model was shaped by eye to suit the judgment and artistic skill of its maker. The shipbuilder or his master carpenter, whichever made the model, however, had to satisfy the skipper of the new vessel as well as the owner that the model represented a vessel of the requisite qualities of seaworthiness, capacity, and speed. The tools used in making the model were various sizes of hollow gouges and chisels, a drawknife and spokeshave, small planes, scrapers, and sandpaper. Hollow- and round-sole planes were required.



Lines of the packet schooner *Charmer* of Newburyport, Massachusetts, 1860. Taken from the boat builder's half-model..



Left, Kettle bottom brig "Salisbury," built Newbury, Massachusetts, 1844.



Dear Lord: On January 1, 1980 I have to have a holding tank on my little boat's head. On boats, Lord, we call toilets heads. Yes, I know, I know, but what I'm praying about isn't funny. You see, I live in Maine where there aren't any pumpout stations and where a pumpout station won't work commercially. Too, Lord, I only go sailing once in a while, and holding tanks cost hundreds of dollars, and Lord, what if I promise to hold it, to control myself? Okay? Lord, please don't let them take my asshole away. Ahmen.

—Fred Brooks

## Fisheries of the North Pacific

**(Histories, Species, Gear and Processes)**
**Robert J. Browning**
**408 pp., 1974**
**$25.45**
**Alaska Northwest Publishing Co.**
**Box 4-EEE**
**Anchorage, AK 99509**
or Whole Earth

*I remember sitting around at editorial meetings at this little publishing house I worked for, the East Coast place that was affiliated with a commercial fishing newspaper, that was supposedly in business at least partially to support the fishing industry with good books, and wondering — as commercial fishing manuscript after commercial fishing manuscript was rejected — why we couldn't or shouldn't publish a book called the Fisheries of the North Atlantic. My colleagues must have been able to read my mind, because they would sweep aside my dumbfounded stares with such thoughts as "Commercial fishermen don't read," or "Books on commercial fishermen don't sell." They could be right, of course, but our Pacific brethren don't know that, so they published the* Fisheries of the North Pacific. *That act neither proves nor disproves the above two statements, but it at least demonstrates an act of faith of sorts. The book is so good that, as a northeasterner, it's the focus of my embarrassment. Will a publisher please step forward to do a book like it on the North Atlantic, the Gulf Coast, and even the Great Lakes?*

*—spectre*

Whatever over-confidence there may have been in the fish processing industry in the early 1960s was quickly and painfully dispelled by a series of deaths in the United States resulting from botulism in canned tuna and vacuum-packaged smoked fish. These were commercial operations, not home processing with its usually greater possibility of error. Carelessness in a California tuna cannery let some few cans of tuna slip out of the cannery after the fish had been precooked and packed but not retorted. The entire American tuna canning industry was in something of a state of shock for weeks after that accident because canned tuna sales plummeted as soon as the deaths were publicized in a nation-wide attempt to run down every can marked with the code of the bad batch.

## The American Fisheries Directory and Reference Book

**Pub. by National Fisherman**
**560 pp., 1978**
**$40**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*Addresses. Everybody loves addresses. The folks over at the* National Fisherman *came to that astounding conclusion a few years ago — commercial fishermen didn't have an industry directory to call their own — and the staff spent a couple of no-doubt inspiring years putting this together. I use it all the time to look up the suppliers of right-hand-threaded gronicles and what-not, not to mention associations, cooperatives, government agencies, congressional committees, and everything else involved in the fisheries.*

*—spectre*

## The Oxford Companion to Ships and the Sea

**Peter Kemp, ed.**
**972 pp., 1976**
**$35**
**Oxford University Press**
**16-00 Pollitt Dr.**
**Fair Lawn, NJ 07410**
or Whole Earth

*As the fellow at the ballpark says, "You can't tell the players without a program." So, too, you can't understand nautical literature – especially naval and maritime history – without a reader's guide.* The Oxford Companion to Ships and the Sea *is your program: at once a fact-filled one-volume encyclopedia for reference when you're reading* Mr. Midshipman Easy *or the* European Discovery of America, *and a vital book in its own right for those who like to browse from one subject, or era, to another. Naturally, the coverage in a book like this is selective, so you won't necessarily find everything you look for at any given time, but what you do get is excellent. I defy anyone with the slightest interest in ships and the sea to read one entry and stop.*

*–spectre*

Kentish Knock, The, a naval battle of the First Anglo-Dutch War (1652-4), was fought near the sandbank of that name in the southern North Sea on 28 September 1652, when an English fleet of sixty-eight ships commanded by Robert Blake defeated a Dutch fleet of fifty-nine ships under Vice Admiral Witte Corneliszoon de With. The Dutch were sighted about noon, 18 miles to the eastward of the North Foreland, but action was not joined until about 5 p.m., when Blake and his vice admiral, William Penn, engaged with the van and centre division. Darkness put an end to the conflict. Two Dutch ships were captured and many others were badly damaged with great loss of men. The English loss was very small.

Sea-virgin from *Cosmographica Universalis* by S. Munster, 1555.

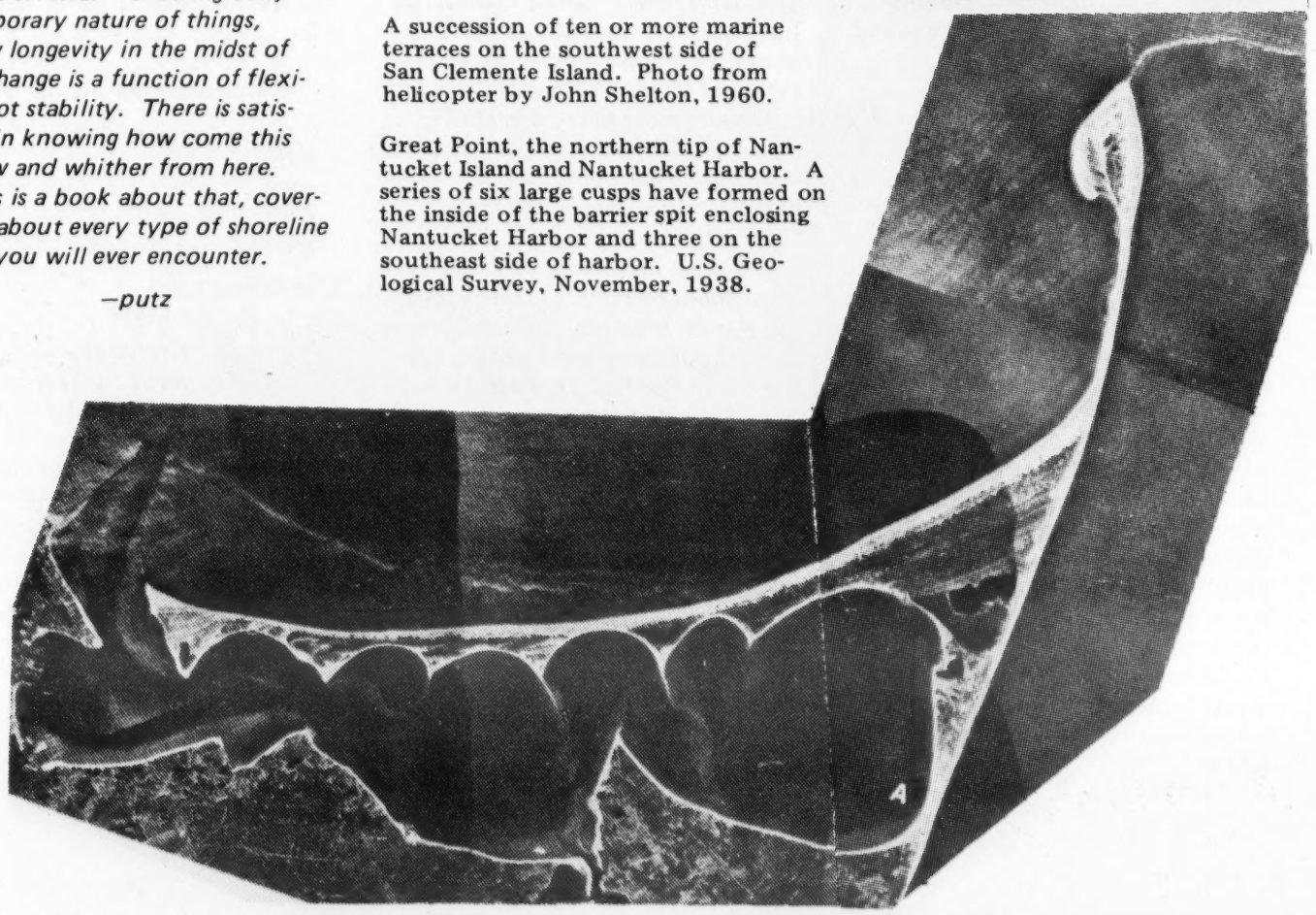
## Our Changing Coastlines

**Francis Shepard and**
**Harold R. Wanless**
**McGraw-Hill Co., New York**
**(Out of print, try libraries)**

*In many ways, the finest ocean cruising is done with feet. Careful study, a restful mind, curiosity, and watchfulness can fill a couple of hundred yards with more adventure than a thousand-mile passage. The pulsing, dynamic ecotone (zone between two relatively stable systems) that is the coast is a kind of living lesson in symbolic survival – showing daily the temporary nature of things, and how longevity in the midst of all the change is a function of flexibility, not stability. There is satisfaction in knowing how come this way now and whither from here. And this is a book about that, covering just about every type of shoreline feature you will ever encounter.*

*–putz*

A succession of ten or more marine terraces on the southwest side of San Clemente Island. Photo from helicopter by John Shelton, 1960.



Great Point, the northern tip of Nantucket Island and Nantucket Harbor. A series of six large cusps have formed on the inside of the barrier spit enclosing Nantucket Harbor and three on the southeast side of harbor. U.S. Geological Survey, November, 1938.

## Those Who Live from the Sea

**(A Study in Maritime Anthropology)**
**M. Estellie Smith, Ed.**
**276 pp., 1977**
**$17.95**
**West Publishers**
**50 W. Kellogg Blvd.**
**Box 3526**
**St. Paul, MN 55102**

## Man and the Sea

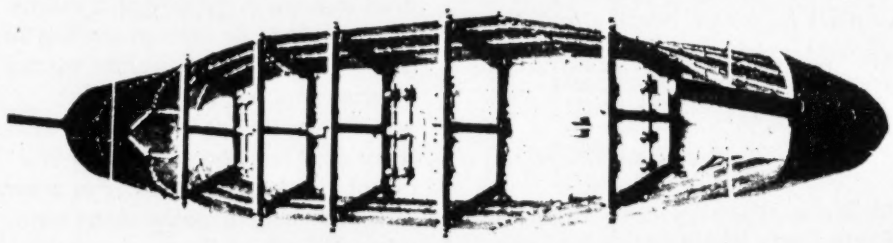
**(From the Ice Age to the Norman Conquest)**
**269 pp., 1975**
**inquire:**
**British Book Centre, Inc.** *(see p. 77)*

*There are hardly any really good general maritime histories and even fewer maritime ethnographic collections that can win the hearts of non-academic readers.* Man & the Sea *and* Those Who Live from the Sea *are exceptional. Considering only evidence and not surmise,* Man & the Sea *treats with the development of boats and the societies who used them in Europe up to the Norman Conquest. It is history, but of a vital sort, and it shows a technology you have in your garage and backyard.*

Those Who Live from the Sea *is a collection of thumbnail monographs of maritime peoples around the world, the Scottish East Coast, Lebanon, Ghana, Ecuador, Gulf Coast, and so on, each focusing on a problem or special social feature of the group. It's anthropology, and from it emerges some common denominators that the sea imposes on those who live by it. Books like these show the Great Saga books to be the mush they are.*

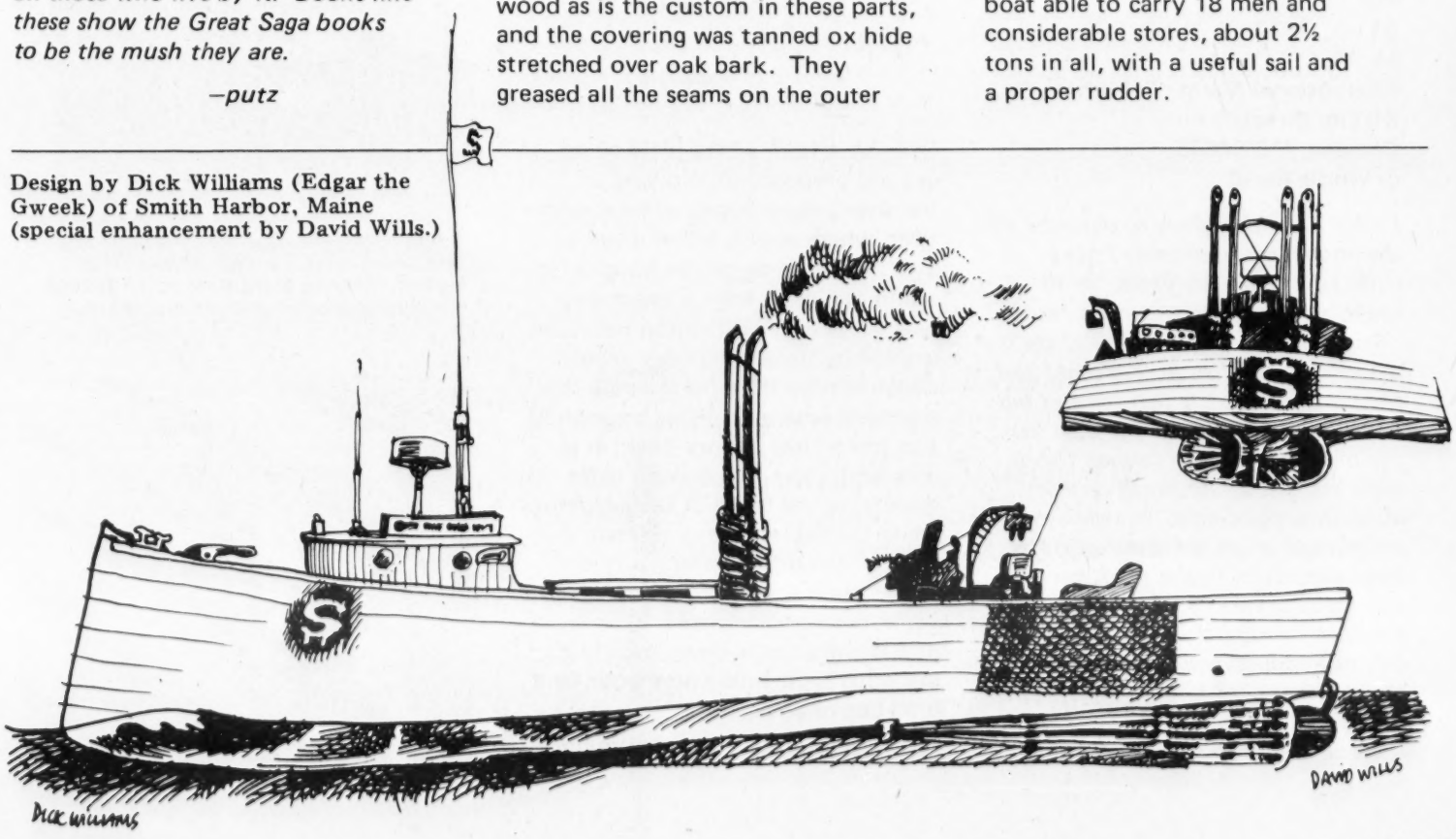
*—putz*

Above, primitive Finnish boat — similar to neolithic migration boats. Below, model of a Ferriby boat from the Humber estuary contemporary with the building of Stonehenge — *Man & the Sea.*



There is a description of Saint Brendan's curragh in the *Navigatio Sancti Brendani,* probably written in the 9th century. He was born about 484 'in the marshy region of Munster' where there were perhaps few trees but plenty of osiers. He made his boat in the Dingle Peninsula, still famous for its curraghs. 'Brendan and his companions made a coracle using iron tools. The ribs and frame were wood as is the custom in these parts, and the covering was tanned ox hide stretched over oak bark. They greased all the seams on the outer surface of the skin with fat and stored away spare skins inside the coracle, together with fat for waterproofing the skins, tools and utensils. A mast and sail and various pieces of equipment for steering were fitted into the vessel.' There were eighteen monks on this voyage and they sailed when the wind was fair and 'rowed and rowed until their strength failed' when it was not. This describes a boat able to carry 18 men and considerable stores, about 2½ tons in all, with a useful sail and a proper rudder.

Design by Dick Williams (Edgar the Gweek) of Smith Harbor, Maine (special enhancement by David Wills.)



## Tales of an Old Ocean

**(Exploring the deep-sea world of the geologist and oceanographer)**
**Tjeerd van Andel**
**176 pp., 1977**
**$3.95**
**W.W. Norton & Co., Inc.**
**500 Fifth Avenue**
**New York, NY 10036**
or Whole Earth

*Every field of specialized scientific endeavor has its verbal generalist who not only performs brilliantly within the secret professional fold, but who also can explain, even popularize, what is going on in there to everyone else. CQ has talked to a bunch of them, and we can all be grateful that they emerge as often as they do. Van Andel is one of the breed to rise out of the sea of ocean geology. His book is an unmitigated pleasure to read, rolling and tumbling the reader through ordinary subjects – plate tectonics, ocean circulation, climate, marine biology, and chemistry – in a relaxed, witty, and fascinating fashion.*

*–putz*

### In Grandfathers's Time You Could Skate Every Winter

Most people think of the climate as basically constant, even though we know that the weather is quite variable. We recognize changes in weather from year to year, even quite large ones, but assume intuitively that the average weather over the years – which means the climate – is today much as it has been for hundreds if not thousands of years. We all know that there once was an ice age when most of the northeastern and midwestern United States was covered with ice thousands of feet thick, but it was so long ago that we regard the occurrence as of only geological and perhaps anthropological interest. Most of us realize that the ice might someday return, but we are imbued with the spirit of the old geologists who believed that all geological processes were infinitely slow and that every major change took an infinitely long time. And so people assume that, if an ice age returns at all, it will be so slow in coming that no single generation will be aware of it.

Actually, these assumptions are false. New techniques have enabled us to date the ice ages much more precisely than in the past, and we have discovered that these catastrophic events are anything but slow in coming and going. For example, a short glacial interval that occurred between 10,000 and 11,000 years ago reached its peak in less than a century and disappeared equally fast. For several hundred years it replaced the temperate forests of England, western Germany, and the Low Countries – which then had a climate and vegetation much like that of southern Sweden today – with tundras, howling winds, and drifting snow. Imagine the consequences of such a drastic and rapid change in climate today in overcrowded northwestern Europe.

## Practical Shellfish Farming

**Phil Schwind**
**91 pp., 1977**
**$8.95**
**International Marine Publishing Co.**
**21 Elm Street**
**Camden, ME 04843**
or Whole Earth

*I wish I had the space to describe all the aquaculture schemes I have listened to over the years. It all seems so simple, in theory at least – "See here, dear, all we have to do is put these little fish in this pond and they'll turn into big fish" – and big bucks are always the lure. Just as the mortality rate of farmed fish is high, so, too, is the death rate of aquaculture projects. It's always a pleasure to meet someone who has been successful in the field, because success is so rare. Phil Schwind's shellfish farming projects have paid off, not handsomely as the pie-in-the-sky theorists would expect, but at least modestly. His book about the practice of shellfish farming is therefore based on experience, something the other aquaculture writers so often lack.*

*–spectre*

Imagine a farm where little or no ground preparation, plowing or harrowing is necessary after the first year, where seed is either given to you by nature or can be bought for a minimal price from a hatchery, where the only cultivation necessary is done by harvesting your crop, where neither drought nor rain is a problem, where fertilizer is supplied and spread free, where blight is almost unknown and there is little disease, where some of the predators are in themselves a money crop and most of the others reasonably controlled with a minimum of hand work, where your produce can be held if the price is down or sold if the price is up, and where your land is all but tax free.

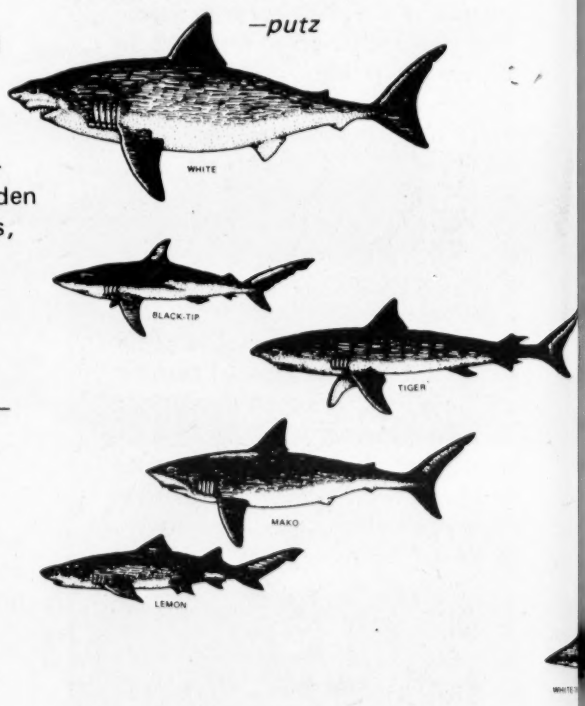
That is a saltwater shellfish farm.

## Oceanography and Seamanship

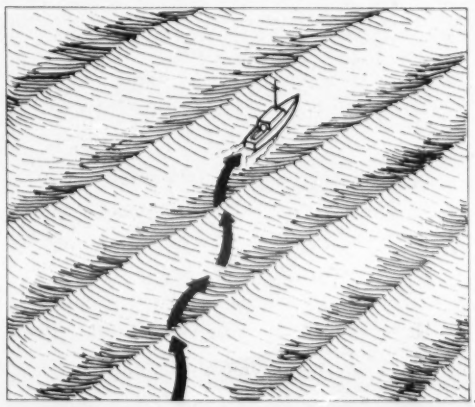
**(A Guide for Ocean Cruising)**
**William G. Van Dorn**
**481 pp., 1974**
**$22.50**
**Dodd, Mead & Co., Inc.**
**79 Madison Avenue**
**New York, NY 10016**
or Whole Earth

*Mental growth comes in fits and starts. Just as a new word you've learned "suddenly starts popping up all over the place," waves, tidal currents, weather, and the interchange of energies between land and sea enriches one's boating experiences so much that you wonder what the hell you were doing all that time before you began learning the stuff. This book is undiluted technical, scientific oceanography; it could easily be used as a college text on the subject, tied into the experience from, and requirements of, mariners on small craft. Pleasures and knowledge mixed: coevolution. Fat, rich book.*

*–putz*




Above, various kinds of shark believed to have eaten people. Below, how to minimize wave forces. — *Oceanography and Seamanship*

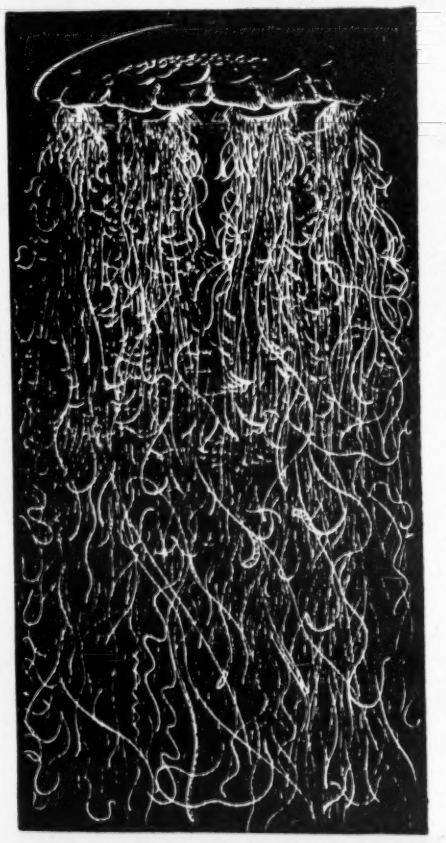


## The Sea-Beach at Ebb-Tide

**Augusta Foote Arnold**
**490 pp., 1968**
**$8**
**Peter Smith, Pub., Inc.**
**6 Lexington Avenue**
**Magnolia, MA 01930**

*We notice that* CQ *and the* WEC *forebearers were never very keen on nature guidebooks, no doubt for the obvious reason that any dumb cluck who wants one can go down to a bookstore and choose the one that meets the requirements of species and locale. I think they're right, as the Sufi say, but Arnold's classic (1901) in Dover edition is so inexpensive and has that quality of observation that only the 19th century could enjoy — precise and naive — a sense in the looking denied us since the naturalists became conservationists.*

*—putz*



**Cyanea artica from** *The Sea Beach at Ebb Tide*

## Nichols Net and Twine

**Rural Route 3, Bend Rd.**
**East St. Louis, IL 62201**

*Always there are these little fish all over the place as you walk along the foam zone or tidepool. Always there is this travel ad showing these guys throwing a castnet for the luau. You can have your very own, plus just about anything else.*

*—putz*

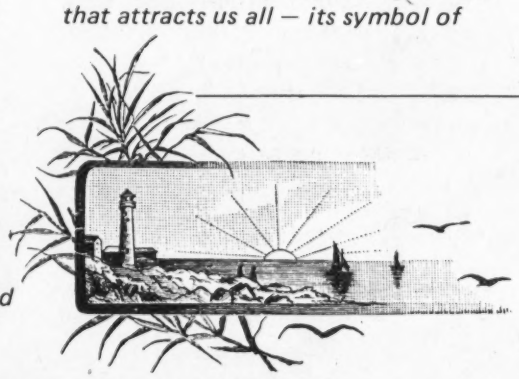
## Lighthouse

**Tony Parker**
**288 pp., 1976**
**$8.95**
**Taplinger Publishing Co., Inc.**
**200 Park Avenue South**
**New York, NY 10003**

*Of the various romantic notions having to do with the sea, serving as a lighthouse keeper at some desolate outpost ranks high on the list. There's something about a lighthouse that attracts us all — its symbol of hope perhaps — which works to advantage for the lighthouse services around the world, since there never seems to be a shortage of applicants for jobs as keepers.*

*I know why I would find happiness on a lighthouse perched atop a half-tide rock, but what about the people who actually do it? Tony Parker was wondering himself, so he took tape-recorder in hand and went around the British coast interviewing light-keepers. The transcriptions of those interviews make fascinating reading.*

*—spectre*



*Breeches Buoy Note*

## *Hey Skipper, come here a minute & look at this.*

And that's the trouble with it. You cannot *try* to skip stones. You must *believe* in your stones. Worrying about getting really flat stones, round stones, stones of a certain weight or heft — any sort of fixation is the beginning of poor stone-skipping. So is throwing hard, or concentrating too much on theories of wrist snap, elbow elevation, crouching positions, torque movements, or entry-angle windows on the ocean's surface. No, you must be casual, haphazard, and confident. Skipping stones next to an expert is exasperating for those prone to a competitive mentality. How could such a slovenly, ne'er-do-well cretin not even look at the beach while he picks up stones, tosses stones anywhere a target may offer, and get twenty soul-searing blasted skips every time?! How?!

It starts with rocks. Part of the earth, which come in forms you would not imagine unless you've paid attention to dreams, and close attention at that. Forms massive, forms busted up into bizarre pieces, twisted into lines of strange intrusion, heaved and bent; and some small portions sent to the surface to face the Furies of wind, water, ice, sun, and the chemical vagaries that produce all things — including people; including skipping stones. Stone skipping is a celebration of brotherhood. To pick up a rock from the myriad there are and skip it is to bless it. The chances of a stone ever being skipped are less even than those for the coming to together of one's own cells to become oneself, for the skipped are predicated on the skipper.

You see how serious it really is. And, like so many serious things, it is too important to be taken merely seriously. That's why nonchalant skippers are the better skippers. The casual blessing sticks, and skips best.

—putz

## Goodbye and Thanks

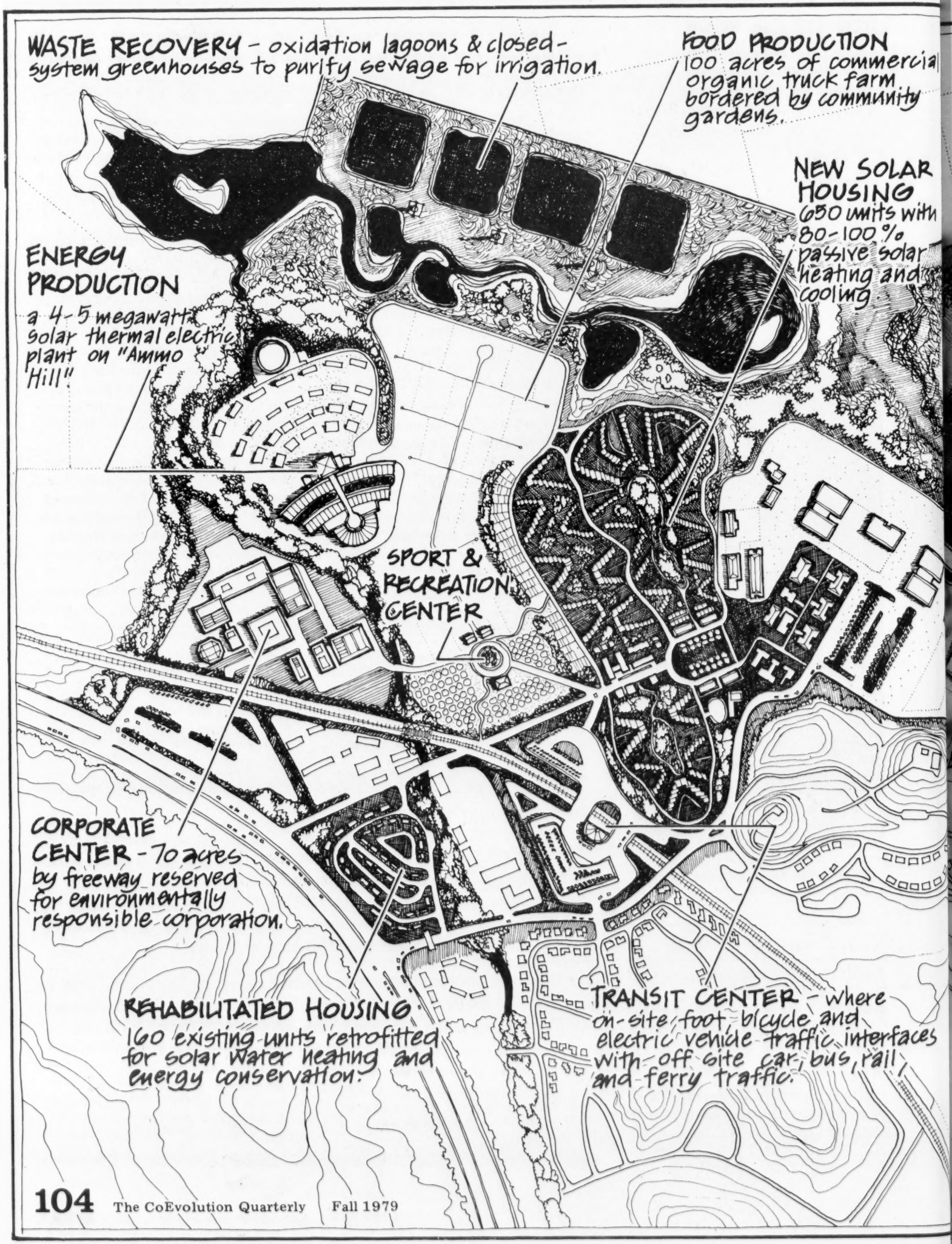
*And that's it. We've run out of space and Stewart is yelling in our ears that this is, after all, his magazine and he wants it back so he can get on with the important stuff. We can't argue with that, since we are still (almost) speechless because of his generosity in allowing us to guest edit the majority of this quarter's issue.*

*We are not speechless, however, when it comes to thanking Stewart publicly for the privilege of showing off to a new audience. Nor are we tongue-tied when it comes to thanking the* **CQ** *staff, who not only made things incredibly easy for us, but also went out of their way to make the issue work the way we all hoped it would. We are grateful to them all.*

*George Putz* *Peter H. Spectre*

# HAMILTON SO
## (FORMERLY HAMILTON AIR FORCE

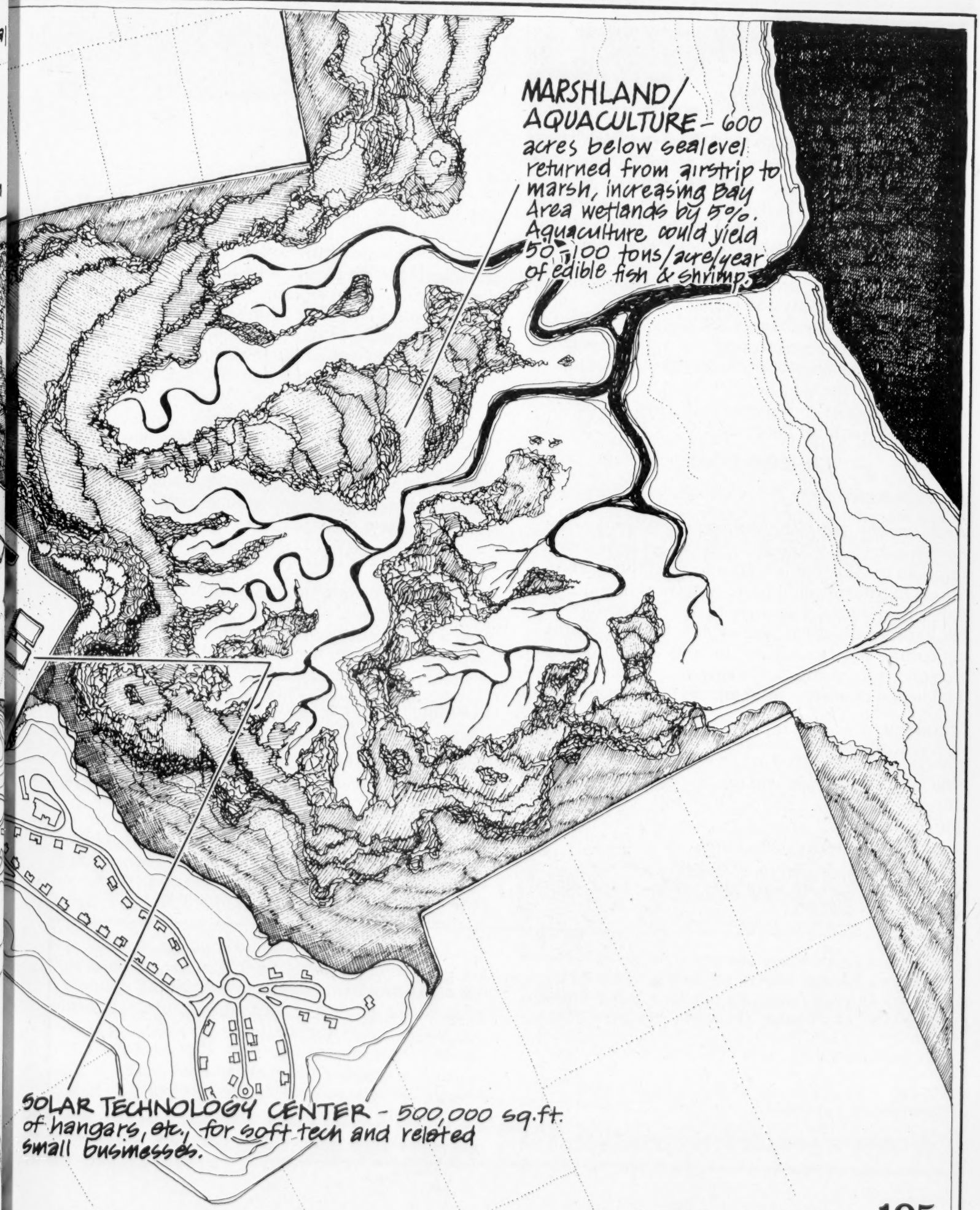
BY SIM VAN DER RYN



# LAR VILLAGE

## BASE, MARIN COUNTY, CALIFORNIA)

ILLUSTRATIONS BY GORDON ASHBY






gordon Ashby '79

*Barbara Wornum*

THE 1,271-acre site of Hamilton Air Force Base in northern Marin County, a half-hour north of San Francisco, was deactivated several years ago and the property declared surplus to federal needs.

Recently, it has been proposed that a diversified community be built on the site – the first modern community on the planet specifically designed for environmental stability and energy self-reliance. In the Solar Village, new homes and work places can be brought together for a cross-section of the population resident in the village, every building can be heated and cooled by the sun, electricity can be produced by wind and biomass conversion, some food can be grown on site and transport minimized.

## CONCEPT GOALS

### ENVIRONMENT

*Restoring the natural environment in balance with human use:* 600-800 acres of below-sea-level areas returned to saltwater marsh and aquaculture pond areas. Expanded wildlife and waterfowl habitat. Other riparian areas returned to native vegetation and habitat for recreational and wildlife use. Productive agriculture and aquaculture, through a careful integration of diverse biological systems and built environment. Linking up of energy, nutrient and hydrological cycles.

### ECONOMICS

*Converting surplus land into a productive balance of new jobs, living places and tax revenue:* 50 percent of residents (800 - 1200) work on site. First cost and operating cost of infrastructure significantly lower than conventional systems. A model for reduced export of money to import expensive high-grade fuels which are wastefully used in conventional development pattern.

### ENERGY AND RESOURCES

*Balancing renewable income energy sources with demand for low-grade and high-grade heat,* nutrients, and water:* Estimate 60 - 70 percent savings in fossil-fuel use for space and water heating, transport, food, waste disposal systems. This is accomplished by technologies including passive solar heating of all buildings for 80 - 100 percent reduction; growing vegetables and tree crops on site; reducing auto use on site by integration of workplace and living place and use of wind and solar charged electric vehicles; recycling all wastes and reducing water use; solar and wind sources of electricity.

•

In short, Hamilton Solar Village will be a new community whose design and use demonstrate how to make the transition to the Solar Age using practical cost-effective techniques, while reducing costs and improving the quality of life.

## PLAN FEATURES

Hamilton is a unique and beautiful area fronting on San Pablo Bay to the east and Highway 101 to the west, ideally suited to such a community, since it is readily accessible to the entire Bay Area, with such tentative land-use potential as:

### REHABILITATED HOUSING

160 units of existing housing for elderly and moderate-income families; rehabilitated and equipped with energy-conservation features and solar water heating.

### NEW SOLAR HOUSING

650 units of attached multiple housing designed for

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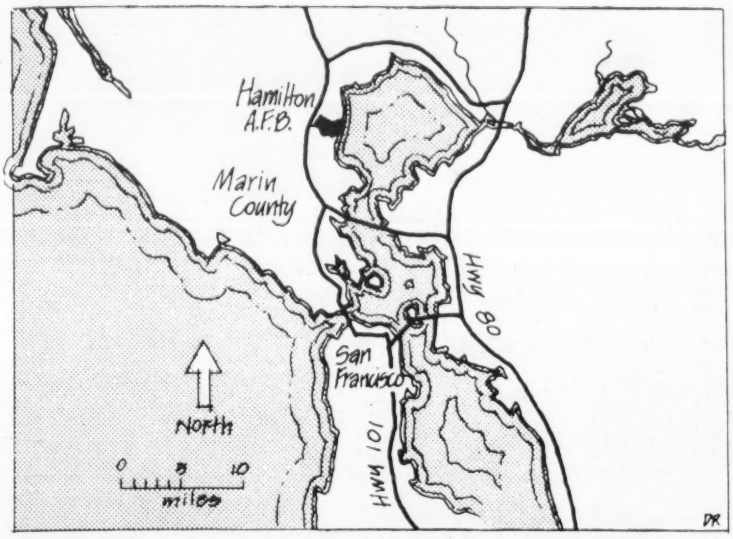
*"Low-grade heat" refers to solar space heating. "High-grade heat" usually involves fuel or electricity.

*Last issue we mentioned that former California State Architect Sim Van der Ryn was thinking about solar activity on a grand scale. It's coming far sooner and faster than he expected. The fantasy has been slurped into life by a hard-fought vacuum in Marin County left by the departing Air Force. This scheme in that place makes remarkable political, economic, and technical sense. If it happens, and it works, it could make a difference for everybody.*

*As architecture critic Allan Temko observed in the San Francisco* Chronicle, *"Every aspect of the plan has been tried and proven feasible before. The radical innovation is that they have been combined so thoroughly."*

*Some of the ideas here come from an outstanding Solar Village Conference organized by the New Alchemists at Cape Cod, Massachusetts, this Spring – in which Sim participated. A report from that conference will be available later this year from the New Alchemists, Box 432, Woods Hole, MA 02543.*

*–SB*




80 - 100 percent passive solar heating and cooling, each with private patio, greenhouse or garden. Privately financed. Preference will be given to residents who work in Solar Village.

### CORPORATE CENTER

A 70-acre site adjacent to the freeway reserved for an administrative, research or manufacturing facility of a major environmentally-responsible corporation. Village housing will be available for some employees. Worker commuters will use van pools primarily.

### SOLAR TECHNOLOGY CENTER

Approximately a half-million square feet of existing structures and hangars will be occupied by Bay Area businesses and institutions engaged in solar and renewable energy and small-scale technology research, education and manufacture.

### ENERGY PRODUCTION

A small solar thermal electric cogeneration facility (subsidized by federal and state energy departments) will supply power for the internal electric vehicle system. Low temperature waste heat from the facility will be used to heat food- and fish-producing greenhouses and for industrial processes and heating. Methane gas produced from sewage and aquatic plants will be used for home cooking and vehicles.

### TRANSIT CENTER

The road system within Solar Village is designed to accommodate service and emergency vehicles and electric-powered vehicles only, reducing land area for cars from the usual 35 percent to 15 percent. Residents' private automobiles will be parked at the transportation center. Internal movement will be by foot, bicycle, electric golf carts and small electric shuttle busses. Shuttle busses from North Marin and Sonoma will bring commuters to the transit center where they may transfer to light rail service or electric busses, terminating at the Larkspur Ferry, which serves San Francisco. This should reduce congestion on U.S. 101 and the Golden Gate Bridge.

### FOOD PRODUCTION

One hundred acres of flood plain are reserved for agriculture, including commercial organic truck farm for vegetables and orchard crops, bordered by community gardens available for resident use. Year-round solar greenhouses grow both food and fish, using waste heat from the solar thermal-electric plant.

## Glossary

| | |
|---|---|
| FSV | Friends of Solar Village |
| GSA | General Services Administration |
| HUD | Department of Housing and Urban Development |
| DOD | Department of Defense |
| DOE | Department of Energy |
| DOT | Department of Transportation |
| EOP | Executive Office of the President |
| FAA | Federal Aviation Agency |
| MTC | Metropolitan Transportation Commission |

### WASTE RECOVERY

Sewage from the Solar Village and treated effluent from Ignacio and Novato Sanitary Districts will be biologically purified in oxidation lagoons and closed-system greenhouses where waste nutrients will be filtered out by aquatic plants and microorganisms. Purified waters will be used for agricultural irrigation and recreational ponds.

### AQUACULTURE AND MARSHLAND

High-quality edible fish and shrimp will be grown in both controlled greenhouses producing high yields (50 - 100 tons/acre/year) and in open ponds. Ponds will be suitable for small boating.

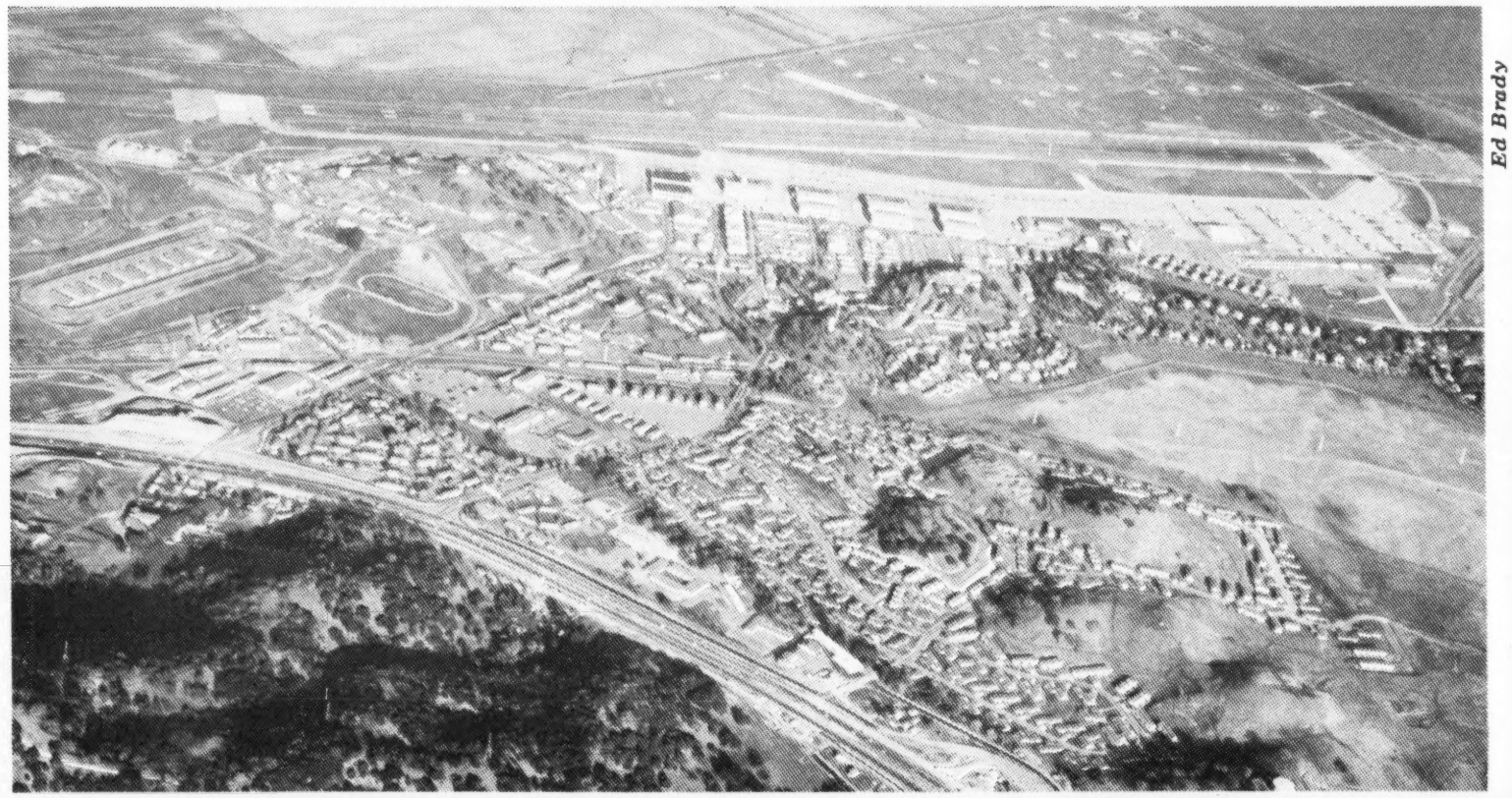
Some 600 acres presently below sea level which cannot be built on due to seismic and flood hazard will be restored to their original condition as salt water marsh, adding five percent to San Francisco wetlands and providing valuable habitat for waterfowl, marine and animal life. This step is in accordance with state and federal policy. The title to this land is in dispute between the Federal Government and State Lands Commission.

•

This potential reuse of Hamilton is a special opportunity to create a model of lasting value. While no plan for the site can solve the major problems confronting urban areas across the country, such a Village can be a "touchable" alternative to a way of life dependent upon dwindling resources. Presently available technology can permit such an alternative without sacrificing the best of our urban, high-technological, information-oriented culture.

## PRESENT PRIORITIES

In early fall of 1979, Marin County can make an application to the General Service Administration (GSA) to acquire the site on a donation and negotiated sale basis. In the next six months, Friends of Solar Village needs to develop a preliminary plan that is acceptable to Marin County and the City of Novato, within whose limits the site lies — a plan that has widespread public support. As the only present viable use concept, the Solar Village plan will be the basis for negotiations with GSA as well as for actual development by the private and public sectors.



Ed Brady

*Hamilton Air Force Base, 1963*

Funds will be needed to:

1) Carry out feasibility analysis on various renewable energy technologies;

2) Prepare a preliminary plan concept and prospectus;

3) Conduct public education on the plan and its features which can also be applied elsewhere to reduce energy costs, improve environmental quality, and help to create a sustainable future.

## PROGRAM SPECIFICS

### ECOLOGICAL STABILITY

Hamilton Solar Village will demonstrate an approach to the restoration of a natural ecological system in a way that restores plant and wildlife diversity while enhancing productivity for human needs.

Of the 1,271 acres offered for reuse, approximately 800 lie below sea level, protected by earthen dikes and requiring constant pumping to keep dry. This existing runway area cannot be developed because it lies in the flood plain and is seismically unstable. We propose to return most of the area to its natural condition as a salt water marsh. Under the terms of the Surplus Property Act, a public agency can acquire property for wildlife conservation at no cost. This action would increase the wetlands area of San Francisco Bay by five percent, provide valuable wildlife and waterfowl habitat, improve water quality, provide recreational area, and is consistent with state and federal policy.

In nature, ecological stability is realized through the complex functional interdependence of many biological systems. Urban design has yet to learn the lessons nature has to teach us. The design of Hamilton Solar Village will imitate the efficiency, integrity, and stability of natural systems by carefully integrating land use and supporting technologies. Some of the community's food and high-grade energy will be produced on site. All water and wastes will be recycled into productive uses.

### ENERGY BALANCE

Hamilton Solar Village will demonstrate the practical and economically feasible potential for vast reductions in our present almost total dependency on fossil fuel energy to drive our economy and life-support systems. Today, each Bay Area resident is dependent on the energy quantity and quality equivalent of 80 barrels of oil per year to provide for transport, thermal comfort, food, and other necessities. All of these resources are imported and represent a net economic drain of sustainable economy in Marin and the Bay Area. All the evidence points to the fact that it is possible to maintain a good quality of life while reducing fossil fuel use by 50 - 80 percent.

Hamilton Solar Village will be a demonstration of planning and energy design techniques to vastly reduce dependency on fixed fossil fuel "funds," relying instead on solar "income" flows. All buildings will be sited and designed to be 80 - 100 percent solar-heated and cooled. Fuel demands for transport will be reduced by providing the option of both home and workplace in the community. Internal transport will be by electric cars run on wind energy. Organic wastes will be converted to high quality energy. On-site agricultural and aquatic food systems will reduce the need to import food. Energy required to pump water from remote locations and process sewage and wastes will be minimized.

### ECONOMIC DIVERSITY

1. Marin County is a bedroom community county without a diversified tax base. The county's largest

employer is Fireman's Fund, located on Highway 101 north of San Rafael. The intention of the Solar Village is to create significant new employment within the county. Approximately one hundred acres close to the freeway is reserved for a major corporate user – for either light industrial or administrative use. This major user could also be the source of investment capital to finance the entire project. Besides providing a prime headquarters site for a project with a highly visible positive image, a portion of the housing could be made available for employees. Since affordable housing is becoming a major factor in expansion of scientifically oriented companies in the Bay Area, housing could be an added incentive to locate and invest in Solar Village.

2. There is approximately 500,000 square feet of sound general office and hangar space on the site which would provide an ideal setting for small business, educational, and research use. The concept is to develop the existing administrative center and hangar space into a Renewable Energy Center, housing small businesses involved in renewable technologies such as manufacturing solar systems, wind machines, sailboats, electric cars, hydroponics, conservation and retrofit technologies and biologically sound agricultural technologies.

3. Strategies will be developed to insure that new jobs created in the Solar Village will be new jobs for Marin and that a certain percentage of people working in the Solar Village also live there.

4. Housing costs in Marin are among the highest in the nation. Under the surplus property procedure, the U.S. Department of Housing and Urban Development (HUD) may acquire designated portions of the site for moderate-income housing. A land write-down, together with the use of other HUD programs can guarantee that a certain percentage of new housing in the Solar Village will be available to families with a moderate income. In addition, 165 existing units of Lanham Act housing (existing government housing for military families) are available. The Ecumenical Housing Association of San Rafael desires to acquire these for rehabilitation and use by low- and moderate-income families.

5. In addition to creating new jobs and additional tax revenue, the Solar Village Concept shows a way to keep more income within the county by reducing the outflow of dollars to imported electricity and fuels. Reducing energy costs creates more disposable income which itself can be invested in reducing energy costs and improving the local environment. For example, one can afford to borrow $8 at 10 percent to save $1 in energy costs (assuming 15 percent annual escalation in fuel costs). At the end of 10 years the investment is paid off but the savings continue. The evidence is that dollars invested locally in conservation and renewable technologies create far more jobs than the capital intensive fossil fuel technologies, which produce few jobs at concentrated locations.

## WORK PLAN

On May 15, 1979 the Marin Board of Supervisors voted to withdraw their application to accept the Hamilton site for use as a county-operated airport. Two factors weighed in this decision. First, the report to the Board of Supervisors by a panel of financial experts which indicated that airport development would not be an economic benefit to the county. Second, the development of this alternative proposal that rapidly attracted people's attention in offering a positive, practical visionary idea.

Now the time has come to more fully test, develop and communicate the Solar Village concept. There are three aspects to this process: *technical planning, government liaison* and *community outreach.* Friends of Solar Village (FSV) is now carrying out this process. Steve McNamara, Chairman of FSV, is organizing community meetings around the county to explain the Solar Village and translate the significance of the concepts into other communities in the county. Talks are also scheduled at schools and service and community organizations. Working with him will be a full-time secretary and a half-time specialist. Study groups are being formed within FSV to advise planning staff on various issues.

Sim Van der Ryn is directing the design effort which includes Feasibility Analysis, Design of Prototype Systems, and Preliminary Planning. The Work Plan details what task staff and consultants will be doing. FSV is coordinating its effort with the Marin County Planning Department and the City of Novato so that the final proposal will be acceptable to both entities. GSA policy states that any plan for reuse must be acceptable to the local community. Liaison is also required with several federal and state government departments. HUD must be involved in order to realize a write-down for housing costs. DOE (Department of Energy) as well as HUD, may be able to make grants for innovative technologies and support systems. The State Lands Commission claims title to tidelands areas; both State Fish and Game and Federal Wildlife Service are interested in marsh restoration.

During the summer and fall months the plan will be developed in coordination with all these agencies and with advisory input by study committees within FSV. In late fall, GSA will again offer the site to the county and this will be a period when community support will be most helpful to the negotiation. After a successful negotiation with GSA, the county will prepare a solicitation to the private sector asking interested corporations or developers to bid on all or some of the site. Developers will have to pay agreed upon value to GSA for buildable sites and in addition follow the plan and ground rules as adopted by the county and city. Our expectation is that many of the innovations in the plan will require special ordinances. Indeed the Solar Village plan may become a special planning zone that allows deviations from present codes and ordinances.

The FSV plan will only be preliminary in nature. Detailed planning of infrastructure, buildings and systems will take place during the implementation phase, after successful bidders have committed to build Hamilton Solar Village.

*more →*

**FEASIBILITY ANALYSIS**

1. *Establish quantitative and qualitative energy parameters.* Determine per capita requirements for low-grade (less than 100°) and high-grade (more than 100°) energy, determine per capita nutrient and water requirements.

2. *Analyze On-Site Resources.* Establish climate data, soils and geology, topography, water availability, ecotypes, vegetation, wind and tide potential, and other relevant resource data.

3. *Employment Analysis.* Analyze site potential for different types of employment in terms of location, available labor force, required space and facilities, impact on local economy.

4. *Housing Analysis.* Analyze housing demand for different housing types and patterns. Identify market and price range and desired housing and community characteristics. Identify special subsidies and services incentives required to produce a diverse housing mix.

5. *Economic Investment Analysis.* Identify probable investment requirements to develop project. Identify potential sources and their requirements. Investigate public and private financing strategies and cash flow requirements. Establish rates of return and risk elements for various aspects of the project.

6. *Cultural Acceptance.* Analyze concept assumptions in terms of use patterns, habits and attitudes. Identify probable value and attitude change that may be required. Evaluate design patterns in terms of cultural acceptance and suggest cultural design and operational principles.

7. *Development Strategies.* Analyze possible development strategies including Joint Powers Authority, financed with revenue bonds; public ownership and leasebacks; construction of support systems; Special Districts, pass through sale. Map out permitting procedure, front end costs, and payout.

8. *Determine Feasibility Criteria for Energy Systems.* a) net energetic yield of system; b) first cost, operating cost, life cycle cost; c) cultural acceptance of operating plan; d) environmental requirements, impact, and suitability; e) integrative potential; f) space requirement; g) scale.

9. *Evaluate High-Grade Energy Conversion Technologies.* a) methane; b) wind electric; c) solar thermal electric; d) biomass combustion; e) photovoltaics (solar electric); f) lifting foils/tidal gates.

10. *Evaluate Low-Grade Energy Conversion Technologies.* a) passive space heating and cooling; b) cogeneration.

11. *Evaluate Nutrient Conversion Technologies.* a) hydroponic closed-cycle solar greenhouses; b) intensive vegetable gardens/truck farm; c) aquaculture/pond mariculture; d) composting/waste purification; e) livestock; f) tree crops.

12. *Evaluate Water Flow and Treatment Technologies.* a) on-site runoff collection and storage; b) solar aquacell biological purification. ■

# THE HAMILTONS

SIM VAN DER RYN'S Hamilton Solar Village proposal has a number of novel aspects, not the least of which is the fact that its chances of happening look exceedingly good. This happy fact has two main political elements: basic community politics which changed one key member of the Marin County Board of Supervisors in last November's election, plus the subsequent release of pent-up environmentalist energies which are now fueling the proposal.

The mixing of these elements begins, oddly enough, with filmmaker George Lucas. Last October at the Thursday editorial meeting of the *Pacific Sun*, editor Joanne Williams had bad news: the cover story for the next week's issue had fallen through. Marin resident and "Star Wars" impresario Lucas had backed out of a scheduled interview which was to cover his planned movie studio in the rolling hills of West Marin.

We kicked around a few suggestions and Williams said, "Why not Sim Van der Ryn? He was Brown's State Architect, he just moved back to Marin and maybe he has something to say."

Williams tracked him down, made an appointment, loaded her tape recorder and headed for the door. As she left I said, "See if he has any bright ideas for Hamilton."

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*Steve McNamara is editor of* The Pacific Sun, *Marin County's outstanding regional weekly. He is also the founder and head of Friends of Solar Village, a shockingly effective lobbying group for the plan. Combining broad grass roots activity and outreach with a dazzling lineup of famous and respected moral supporters, FSV is working like a well-aimed focussing solar collector. The considerable diffuse good feeling for Hamilton Solar Village in the county is collected and focussed in good time at each appropriate target in the political process.*

*Hamilton Solar Village has matched sophisticated soft tech design with sophisticated political technique. Together they are nigh unstoppable. That's why I'm printing all this. Hamilton Solar Village is an integrated design using an integrated process to become specifically adapted to where it is. You could do the same or better where you are.*

*Note: Lots of military land is reverting to civilian use around the U.S.*

*—SB*

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*Mill Valley, CA 94941*
*(415) 383-4500*

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*Van der Ryn, Calthorpe & Partners*
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# POLITICAL ECOLOGY OF SOLAR VILLAGE

BY STEVE McNAMARA

Hamilton is an Air Force base up Highway 101 in Novato which had been the subject of boring wrangles since being abandoned by the feds in 1974. One faction wanted to move the county airport there and have have it grow into a regional facility which would create a real estate boom. Another faction, centered in Novato, was bitterly opposed to the return of noisy air traffic. Outside of North Marin nobody gave a damn. The *Sun* runs periodic reader polls and the one on Hamilton drew fewer responses than any county issue in 10 years.

But in Novato it was an increasingly hot issue. Recent city council elections had hinged on it, with airport foes gaining a shifting majority on the five-member council. Novato's supervisor on the county board, Arnold Baptiste, was re-elected in 1974 when the Air Force had just been packing its bags to leave Hamilton.

As the years passed Baptiste backed the airport while his constituents moved in the opposite direction. Last November he was stunned to find himself replaced by Novato councilwoman Gail Wilhelm.

When Wilhelm took her seat in January it would tip the balance on the county board: for the first time there would be a majority opposed to Hamilton aviation on both the Novato council and the county board. The position of each group is important: Novato because the base lies within its city limits, the county because it is higher in the pecking order for disposition from the federal General Services Administration. GSA disposal guidelines give great weight to strong community support.

That was the political picture as Williams headed for Van der Ryn's place in Inverness: the Hamilton issue, long stymied by the split between the anti-aviation Novato council and the pro-aviation county board, was at last capable of some forward movement. What was needed was an idea.

Van der Ryn didn't have one, at least not at the moment. He said that he hadn't followed the Hamilton controversy and knew virtually nothing about the place. That didn't surprise me; except for Clark Blasdell, nobody had any bright ideas for Hamilton.

Blasdell is a registered professional engineer, Volkswagen mechanic, rock band manager and all-around entrepreneur, idea man and non-stop talker. His letterhead is adorned with a happy face and the injunction to "Remember the CLARK-FACE." Concepts rush forth in a torrent. Blasdell is an intense, bright guy but he has never established much credibility.

*more →*

# *WHAT CAN I DO?*

## Pick out where you want to fit in:

***(Details will be explained at first meetings of groups)***

***Dozens of volunteers***

* TYPING - for mailing lists, newsletter, records, letters, research reports, etc. (Even an hour will be helpful.)
* MAILING - help to mail monthly newsletters & notices of meetings, up-date membership records & file a little.
* TELEPHONE volunteers - here at the office or at home to contact people for meetings and special projects, act as answering service for specialists when needed, and communicate emergency developments.
* COOP TABLE volunteers - any weekday or Saturday 1-3 p.m. for brochures, information and petitions.
* PETITIONERS - who will take one petition, get it filled (20 names) and return to office. (And then another??)
* COMMUNITY CONTACT people - one from each community to contact all groups, solicit support, get on agendas to make presentations, keep advised of any local activity or development relating in any way to Solar Village concerns, alert staff and mobilize help as needed.
* CLIPPING SERVICE people - who will glean any pertinent news items from papers, periodicals, radio, TV, and get it to:
* DATA BANK person - who will get data to appropriate people.

## When you decide,

## proceed at once to sign-up tables

***Specialists***

MEDIA REP - will set up interviews when appropriate, put together press packet, press releases, establish contact with TV, radio, and newspeople and keep up a steady flow of information and follow-up calls. This person will only need to be responsible for rough drafts: staff will marshall volunteers for typing and mailing needs.

SPEAKERS - to address local groups, with slides and visuals, keep briefed to respond to question and answer periods.

ARM TWISTERS - to seek pledges from businesses, arrange sale of bumper strips, buttons, ???, handle money-raising benefits and events, assist with grant proposals, establish personal contact with large donors (potential).

COMMUNITY OUTREACH COORDINATOR - will facilitate the efforts of the Media Rep and Speakers. Since this is a potential bottleneck of information, this person will write/edit the monthly newsletter.

RESEARCH COORDINATOR - will assist individuals and groups doing various information gathering projects on specific technical subjects. Will submit rough drafts of this information for publication as required. (Again, staff and volunteers will provide typing assistance.)

AIRPORT TRUTH SQUAD - to gather all info and data to counter the slanted picture airport proponents are presenting, and get it to the Media Rep for publication.

MARINA study group - to investigate how to create and maintain a sailboat marina.

CIRCULATION SYSTEMS group - to study internal transport systems and light rail link, freeway linkage.

FOOD SYSTEMS ANALYSTS - to accumulate pertinent info for use and publication (gardens, truck and community and individual, greenhouse gardening, nutrition, tree crops, etc.)

POWER POTENTIAL group - to study power tower, solar ponds, wind, methane-fuelled cogeneration, biomass sources.

SOCIOLOGIST and related researchers - to study external impaction, employment and labor data, housing data, cultural acceptance, psychological impact.

ENDORSEMENT COORDINATOR - to direct efforts to solicit support and commitments from individuals, groups, and agencies.

Blasdell had a plan called HARP – Hamilton Area Redevelopment Project. It called for an alternative energy center and industrial park plus a very large housing component using the airport runways. All this was embellished with what Blasdell saw as two essential economic aspects: business ownership by Employee Stock Ownership Plans (ESOPs) and Land Value Taxation, the idea advanced at the turn of the century by Henry George and embraced ever since by his followers, who include the current Republican Assemblyman for Marin, Dr. William Filante.

Blasdell's HARP plan had solid aspects, but it got exactly nowhere. Some people took one look at the happy face on the opening sheet of his proposal and moved on to the next piece of mail. Others such as Novato council members were turned off by Blasdell's lack of credentials plus the large housing element. (Novato's growth management plan limits all North Marin to 500 new housing units per year). Finally, Blasdell's timing was all wrong. To most Marin residents two or three years ago, energy was as boring as Hamilton Air Base.

The *Sun* had never covered Blasdell's plan. When Williams wrote her interview with Van der Ryn, it contained no plans for Hamilton, either. It did contain compelling views on energy, economics, the environment and community life and even before the issue was printed I called Sim and suggested we get together. He showed me an article he was writing on "The Sustainable City," first cut at a book he had agreed to write. One glass of wine led to another and we agreed that while on a January vacation in Mexico, Sim would revise the article for publication in the *Sun* – and at the end he would suggest Hamilton as the site for the first sustainable city.

I began to raise hell in my weekly column about the need for vision at Hamilton. The only proposal on the table was a shopping center scheme of dubious merit and readers grew weary of having me inveigh against "two stories of air-conditioned dress shops" as the highest and best use of that incomparable site. I was getting tired of it myself when I had a visit from Marin resident Alf Heller, old friend, founder of California Tomorrow and true heavyweight among national environmentalists.

Should I shut up? No, said Alf, we really do need vision on Hamilton. I briefed him on Sim's upcoming article. Alf, whose own idea had been an environmentally-oriented world's fair to get the place built in an exciting way, liked Sim's proposal instantly. Having Alf aboard is incredibly valuable. When you or I call for an appointment with Senator Cranston, nothing happens. When Alf calls, we sit down with Cranston in a matter of days.

"The Sustainable City" appeared as the *Sun* cover story in the March 11 issue. We began to organize politically, first over breakfast at Zim's in Greenbrae with Sim, myself, and County Supervisors Wilhelm and Barbara Boxer. Driving to the meeting an idea struck me: why not re-create the galvanizing political movement which took over Marin 20 years ago?

Prior to the Fifties Marin had been a lovely green space across the Golden Gate with fewer than 100,000 residents, thousands of summer homes for San Franciscans, a business community dominated by old-timey San Rafael merchants and a political scene run by an honest-to-goodness Courthouse Gang in San Rafael. Conservation was a top-down affair, very noblesse oblige. The people who cared most about greenery had gardeners to trim it. When William Kent wanted Muir Woods to be a national park he simply gave it to the federal government – he had owned it in the first place.

With the influx of commuters in the Fifties, things changed. The new professionals pushed progressive causes, and the Courthouse Gang held on tighter. It came to a head in 1960 when Southern Marin supervisor Vera Schultz was thrown out of office and replaced by J. Walter Blair. With him the old boys had a majority on the board and they voted to move hated county administrator Alan Bruce out of his office and into a closet and to stop work on the new Civic Center designed by Frank Lloyd Wright.

The new citizenry awoke with a roar. Mass meetings were held, the Marin Council for Civic Affairs was formed, and a recall campaign was launched against supervisor Blair. He never knew what hit him; he was bounced from office in less than a year and replaced with a promising Mill Valley councilman named Peter Behr. The new board majority moved administrator Bruce back into his office and resumed work on the Civic Center.

The energy released in this civic explosion lasted for more than a decade, fueling drives for open space, electing majorities to nearly every city council and leading to movements against both the Vietnam war and unbridled county growth. But over the past five years the surge had run down. Causes were mostly of the No variety: No Dams, No Pesticides, No Nukes. Always being against things gets to be a bore. But here was Solar Village with a chance to say Yes. There seemed a good chance we could again unleash the energy for positive change. And Good Lord is it working! Eight weeks after we had formed Friends of Solar Village we had more than 2,000 members. Every meeting has pulled an overflow crowd. No matter where the proposal is presented, the first question from the audience is invariably, "How can I get involved?" This grass roots support, along with the virtues of the plan itself, yields impact politically:

- On the federal level, Senator Cranston and especially Congressman John Burton have been highly supportive. Sim landed a Department of Energy planning grant with unbelievable speed.

- Bill Press, outgoing state director of the Governor's Office of Planning and Research, set up a team from six state agencies to support the plan. Even if the team never turns a wheel, its formation was a powerful message. Press, who hopes to run for the Assembly from Marin next year, easily saw the popular appeal of the idea.

- Senator Barry Keene is strongly behind the plan.

*photo credits. l to r: J.Colby, R.Baltar, R.Baltar, L.Cunkle, R.Baltar*

photo credits. l to r: J.Colby, R.Baltar, R.Baltar, L.Cunkle, R.Baltar

*Barbara Boxer* **FOR** | *Gail Wilhelm* **FOR** | *Denis Rice* **DECIDING** | *Gary Giacomini* **DECIDING** | *Bob Roumiguiere* **AGAINST**

*The Marin County Supervisors and their Solar Village positions.*

Some Marin conservationists are suspicious of Keene; his alliance with Solar Villages helps him as much as it helps us.

• Our State Assemblyman Filante is, as usual, unclear. He needs the County Republican Central Committee, which wants an airport. But he sees the popular appeal of the Solar Village and is a friend of Blasdell's. So sometimes he says he is for the airport; sometimes he says he is for a referendum on the airport. Usually he backs some kind of solar village.

• On the regional level, both the Bay Conservation and Development Commission and the Metropolitan Transportation Commission (MTL) are waving old maps which show Hamilton as one of four possible sites for a North Bay Regional Airport. We think they will revise their thinking when some facts sink in. For example, the North Bay generates only two percent of the Bay Area's airline passengers. An airport for this tiny group is ludicrous, especially when MTC's own study shows that such an airport would use an additional one million gallons of fuel per year. There would be some saving from shorter car trips by North Bay passengers, but this would be vastly offset by increased airplane fuel consumption stemming from the use of smaller planes with extra takeoffs and landings. Also, an airport in the Marin boonies runs counter to the state Urban Strategy of concentrating such facilities and serving them with rapid transit. Finally, the main Bay Area airport problem is underutilization of Oakland Airport. The East Bay generates seven million passengers per year but only three million people use the Oakland Airport. Solving that problem is what will make sense of airport usage; not creating an airport in Marin for two percent of the area's passengers.

All these elements become important only if the proposal passes muster with the five-member Marin County Board of Supervisors. Here's the picture there:

Bob Roumiguiere is a real estate dealer and land investor. He is fervently behind the airport because he likes growth, he likes flying (he and his wife are taking lessons) and he likes to see money change hands. Many of his friends would do very nicely if there were intensive development arising from an airport at Hamilton. Roumiguiere is a power in the Republican Central Committee and is an exceptionally smooth political operator. Watching the Solar Village idea catch fire, he promptly announced that his airport plan now includes a "mini solar village." (If small children could vote, his plan would probably sprout a workshop for the Tooth Fairy.)

Gary Giacomini is in a dreadful fix. He was elected to the board with the strong backing of environmentalists and they nearly pulled him through in his narrow loss to Barry Keene in the State Senate race last fall. These people, who back Solar Village, are essential to his hopes to win the Assembly seat in the general election next fall. But before he gets to the general election, he must dump incumbent Filante in the Republican primary. To do that he needs the backing of key Republicans such as Roumiguiere, especially since Roumiguiere co-signed a $3,000 note for his last campaign.

Gail Wilhelm was elected from Novato on an anti-airport platform. The sentiment then was that nearly anything – a beer factory, a garbage dump, a rendering works – anything that replaced an airport was OK. Now Wilhelm has moved to active support of Solar Village and has brought with her the critically important support of Novato residents and councilmen.

Barbara Boxer is an immensely energetic person and Solar Village's strongest political backer. She has an almost evangelical determination to make it happen. By itself this is important, especially since she is the probable next chairperson of the board. Add the fact that Boxer was once an aide to Congressman Burton and is trusted by him implicitly and you see why she is Solar Village's strongest political asset.

Denis Rice, current board chairman, is an exceedingly competent corporation lawyer who approaches political decisions with the same simple demand that he makes of law cases: he wants the facts. He appointed a blue ribbon committee to study the economics of an airport at Hamilton. When the facts came in negative, Rice became the airport's most articulate and implacable foe. On Solar Village, Rice wants economic facts. If they look right, he will support it.

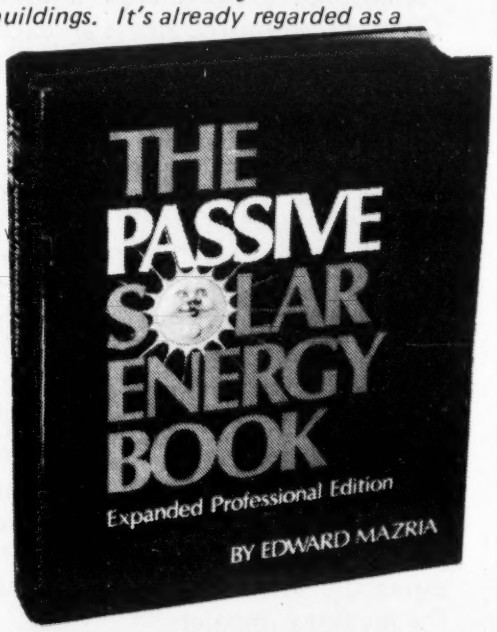
It looks good for Hamilton Solar Village. ■

## The Passive Solar Energy Book

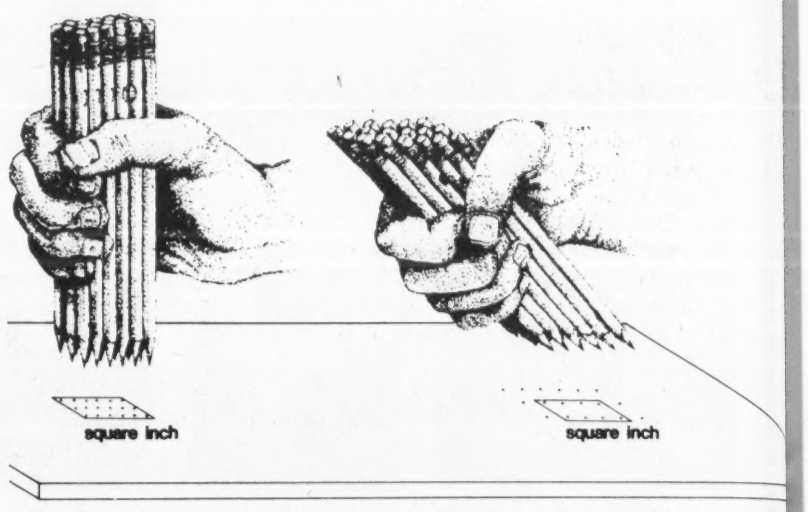
*I have come to regard new solar energy books almost as a personal assault. The majority are the same old stuff with a new title, are dull, and are maddening to review. Once in a while, though, a really fine useful book comes by that makes up for the others. This is one of those books. It has all the attributes that one could reasonably demand: basic principles are explained with unusual brilliance (the best I've seen), the principles are reduced to "rules of thumb," examples are given, and a workbook format makes it easy to apply what you've learned. This expanded professional edition has massive references and charts of such essentials as Time Lag Of Heat Flow Through Walls and Roofs. The latest numbers are from field work (in contrast to many other books) and give the designer the tools to calculate passive details with confidence. Also included are transparent overlays that enable the figures to be applied to your particular geographical area. The charts (along with the photos and illustrations) are mercifully large and well printed. The whole thing has a friendly tone to it instead of the more common preaching-to-the-dumb-dumbs. What more could one ask? Incidentally, this is the book that government officials are using as a reference when making the solar tax rebate laws for passive buildings. It's already regarded as a classic, for good reason.*

*—J. Baldwin*

**The Passive Solar Energy Book**
(Expanded Professional Edition)
Edward Mazria
1979; 687 pp.
**$24.95** postpaid
from:
Rodale Press
33 East Minor
Emmaus, PA 18049
or Whole Earth




The most common definition of a passive solar-heating and cooling system is that it is a system in which the thermal energy flows in the system are by natural means such as radiation, conduction and natural convection. In essence, the building structure or some element of it *is* the system. There are no separate collectors, storage units or mechanical elements. The most striking difference between the systems is that the passive system operates on the energy available in its immediate environment and the active system imports energy, such as electricity, to power the fans and pumps which make the system work.




*Energy density is determined by the angle of incidence.*

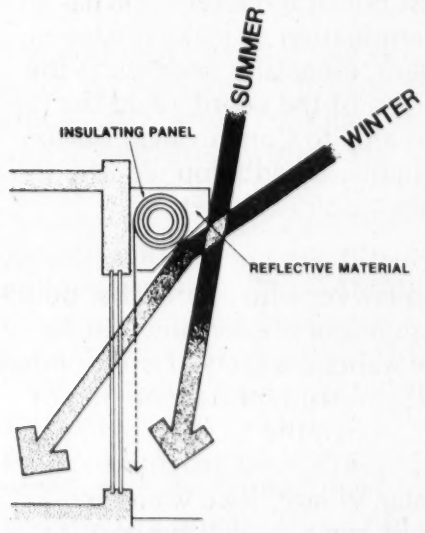
**There are two basic elements in every passive solar-heating system: south-facing glass (or transparent plastic) for solar collection, and thermal mass for heat absorption, storage and distribution.** Popular belief has it that a passive building must incorporate large quantities of these two elements. Our studies show, however, that while there must be some thermal mass and glazing in each space, when properly designed they are not necessarily excessive.

•

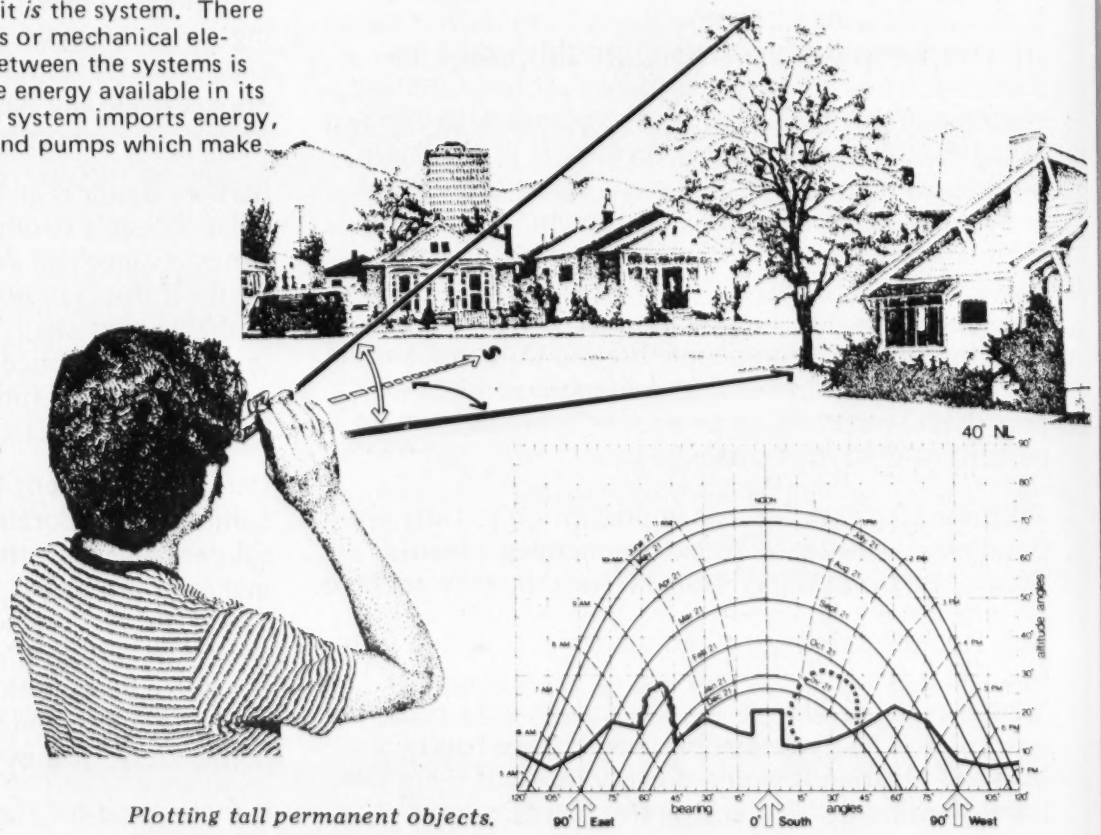
**While good at storing heat, a masonry exterior wall used as a heat storage medium within a space will also readily pass this heat to the outside.** Masonry materials such as brick, stone, concrete and adobe can store large amounts of heat. A masonry wall by itself, though, does not provide good insulation. For example, 3½ inches of fiberglass insulation has the insulating properties of 12 feet of concrete or 4 feet of adobe. In a Direct Gain System a large portion of the heat stored in an exposed masonry wall will be lost to the exterior.

**The Recommendation**

**When using a masonry wall (exposed to the exterior) for heat storage, place insulation on the outside of the wall. Also, at the perimeter of foundation walls, apply approximately 1½ to 2 feet of 2-inch rigid waterproof insulation below grade. This will prevent any heat stored in the walls and floor from being conducted rapidly to the outside.**




*Overhang/reflector, Ike Williams Community Center in Trenton, NJ.*



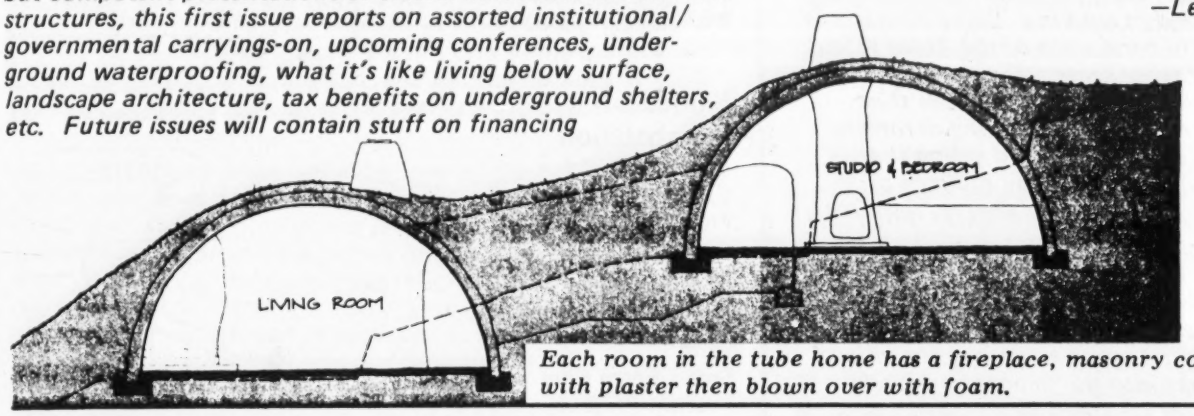

*Plotting tall permanent objects.*

## Earthshelter Digest

*As national energy problems (and perhaps cumulative paranoia) loom larger on the near horizon, interest in underground building is picking up steadily. Here's a magazine on the subject, and their first issue looks very promising. Besides brief-but-competent presentations of several innovative sub-surface structures, this first issue reports on assorted institutional/governmental carryings-on, upcoming conferences, underground waterproofing, what it's like living below surface, landscape architecture, tax benefits on underground shelters, etc. Future issues will contain stuff on financing sub-surface homes, zoning problems, underground recreation, insulating below ground, sub-surface lighting, a regular special section on alternative energy and its applications vis-a-vis underground structures, and like that. Looks like a clean editing job by responsible, concerned folks. Support your local underground by subscribing.*

*—Lewis Watson*

**Earth Shelter Digest & Energy Report**
Herb Oviatt, ed.
**$15** /yr., 6 issues
from:
Earth Shelter Digest
479 Fort Road
St. Paul, MN 55102




*Each room in the tube home has a fireplace, masonry covered with plaster then blown over with foam.*

## The Wilderness Home Powersystem and How To Do It

*You can equip a home to use 12 volt DC power. I've lived that way for more than 5 years with no serious problems (and no washing machine or freezer), so I can vouch that it can be done without having to live like a swine. The basic idea is that you power your household needs with a 12 volt battery which is recharged by your car (it can be done as you drive if you wish) or other source of power such as a small gasoline generator set or a wind machine. These books (for some reason there are three) tell you what you need to know to rig the hardware for safe efficient use. It can be done to meet code. Everything is explained by big clear diagrams and a text that assumes that you know nothing about electricity. The publishers also sell an assortment of necessary hardware, though some of their selections might be the subject of controversy. The books are intended for beginners. Experienced 12-volters will not find much new.*

*—J. Baldwin*

**The Wilderness Home Powersystem and How To Do It**
Jim Cullen
1978; 130 pp.
**$12.95** postpaid

from:
Wilderness Home Publishing Co.
P.O. Box 732
Laytonville, CA 95454

## Building Regulations

*They ain't no hassle like a building inspector hassle, as many persons of Good Intent have discovered to their sorrow. There have been several good strategy books such as Ken Kern's* **The Owner Builder and The Code** *(Soft Tech), and a few good articles showing field-tested ways of getting the inspector on your side; Lloyd Kahn's comments in* **Shelter 2** *(CQ, Winter '78) come to mind. But this is first book that helps you to understand the codes yourself. With it in one hand and the code in the other (and a firm grip on your blood pressure) you should be able to determine what your chances are for getting a new idea passed. Mr. Vitale explains the codes section by section and then inserts lucid paragraphs labelled "Code Reading Technique" to help you untangle your own local situation. He also makes the best case I've seen for code reform, and does it in a way that will help you present your views to your congressman or board of supervisors. Massive references to state codes finish up this most excellent and useful book. I don't envy Mr. Vitale for having to read all those codes, but I'm glad he did.*

*—J. Baldwin*

**Building Regulations**
(A Self-Help Guide for the Owner-Builder)
Edmund Vitale
1979; 212 pp.
**$12.95** postpaid

from:
Charles Scribner's
Vreeland Ave.
Totowa, NJ 07512
or Whole Earth

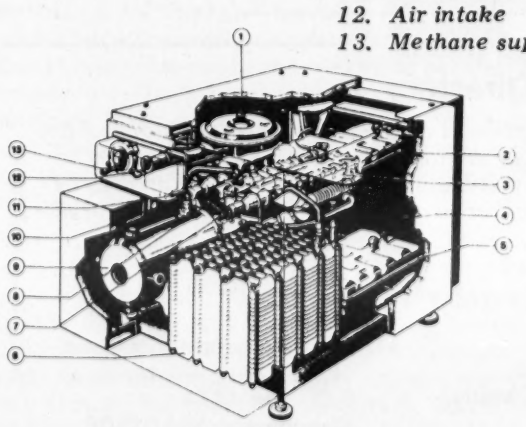
## Fiat's TOTEM (Total Energy Module)

*Well we've seen a lot of writing about saving energy by being more efficient, but we haven't seen much hardware to back up the talk. Here's an idea that I believe needs to at least be tried. It has some good things going for it: it permits decentralized electric power, it can be financed a bit at a time by private parties (or more accurately, neighborhoods), it can greatly reduce the need for expensive standby peak-load power stations and their distribution networks, it eliminates the possibility of wide power outage, and it is a commendable 90% efficient! (That's compared with about 55% efficient for municipal power.) So how does it work?*

*A small auto engine (Fiat, of course) runs an electric generator. The generator is already quite efficient, but auto engines are notoriously inefficient. Many are 20% as installed in cars. What is inefficient about them is that they turn most of the power available in the fuel into heat instead of work. TOTEM catches this heat and uses it to make hot water, for space heating, and to run heat pumps. The heat-catcher housing also stops noise from escaping. The whole thing makes less pollution than a common oil burner furnace. It can be rigged to run on methane. One hundred cows can power a small neighborhood. System costs, including running, fuel and overhaul every 3,000 hours are less than for typical municipal power. So TOTEM could save 70% on fossil fuel in addition to the above advantages. Sounds good doesn't it? Fiat thinks a TOTEM unit could sell for about $3,000. —J. Baldwin*
*[Suggested by Eric MacKnight]*

**Fiat TOTEM**
Information from:
Fiat Motors of North America, Inc.
155 Chestnut Ridge Road
Montvale, NJ 07645

1. *127 Engine*
2. *Water tank*
3. *Gas/water heat exchanger*
4. *Oil/water heat exchanger*
5. *Oil/tank*
6. *Water/water heat exchanger*
7. *Hot water output*
8. *Gas exhaust*
9. *Electric motor*
10. *Cold water input*
11. *Connection to network*
12. *Air intake*
13. *Methane supply*



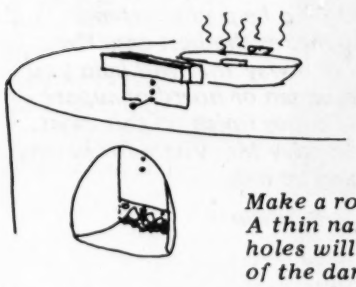
## Lorena Owner-Built Stoves

*Enclosed is a copy of our new book. It details the design and construction of an innovative highly efficient cookstove, originally developed in highland Guatemala (and taught in stove building workshops in California and Oregon). The stove costs almost nothing to make, yet saves half or more of the firewood normally used in cooking. Some 80 percent of the energy consumption in rural areas of the Third World is for cooking, and many of these same areas are suffering from major deforestation problems. Lorena stoves thus appear to offer a very important tool in fighting deforestation, extending traditional fuel supplies, and easing the burden of long-distance hauling of wood by millions of people. Another low technology 'plug' as energy 'resource.'*

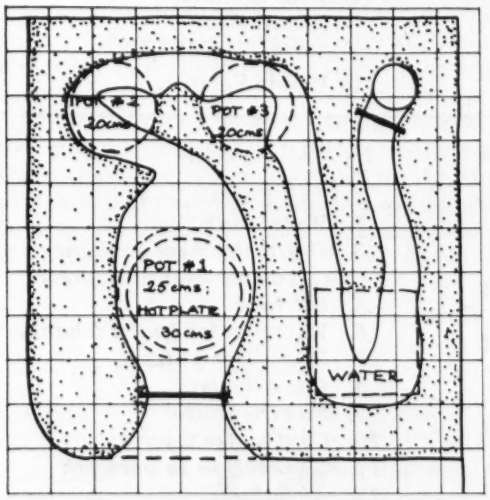
*Curiously, by relying on easily learned skills brought into communities via footpaths, these stoves seem likely to have much greater impact than the kind of high-tech integrated solar photovoltaic/windgenerator/biogas systems being proposed by some international agencies, among the villages of the world. (Having bought into the 'biogas bonanza' ourselves 5½ years ago, we are surprised at the advantages offered by simple improved stoves.)*

*—Ken Darrow*

**Lorena Owner-Built Stoves**
Ianto Evans
1979; 80 pp.
**$3.00** postpaid
from:
Volunteers in Asia
Box 4543
Stanford, CA 94305



*Make a row of small holes in the damper. A thin nail placed through one of these holes will allow you to adjust the depth of the damper in the stove tunnel.*




*Basic household model, especially suited to corner of kitchen. 3 pots & water heater; 1 meter on each side.*

## Woodstove Directory

*A class portrait of most of the stoves now available. Alas, nothing more than the manufacturers' bragging serves as description, but this is still a good place to get an idea of what's on the market to choose from. A big list of retailers is included.*

*—J. Baldwin*

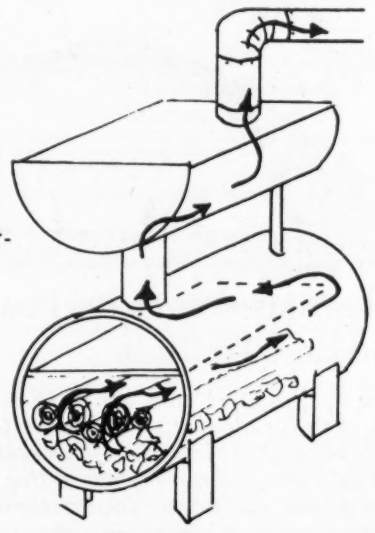
**Woodstove Directory**
1979; 208 pp.
**$2.50** postpaid
($3.00 Canada)
from:
Energy Communications Press
P.O. Box 4474
Manchester, NH 03108

## Woodstove Construction

*Detailed instructions for making two stoves, a "double drum" type and a rectangular box. The cost of either should be about $100, which is not bad these days. Both require considerable welding. Both are well-proven, efficient designs. The instructions are well detailed and should enable anyone with the necessary skills to produce a good house heater.*

*—J. Baldwin*

**Woodstove Construction**
(How to Build Excellent Wood Heaters)
Al Ulmer
1979; 46 pp.
**$3.50** postpaid
from:
Small Farm Energy Conservation Project
Federation of Southern Cooperatives
P.O. Box 95
Epes, AL 35460



## National Solar Energy Education Directory

*I could probably print a Sunday* New York Times *on the paper recycled from the letters I've received from people asking "where can I find a school that teaches solar energy subjects?" Here's where you find out.*

*—J. Baldwin*

**National Solar Energy Education Directory**
Solar Energy Research Institute
1979; 279 pp.
**$11.00** postpaid
from:
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161

## Lineman's Gloves

*Until a pair of these landed on my hands a few months ago, I had about given up on ever finding decent workgloves. These beauties are about the best I've ever seen. Soft, sturdy and with a trick thumb contour that lets you do fairly delicate nabbing, they really protect your hands and wrists. Send a draw-around of your hand to get the right size. They come with winter liners. The same outfit also distributes a clever variable-speed heating duct fan system.*

*—J. "50-fingers" Baldwin*

**$17.00** approx.
(write for price)
from:
Technical Fix Inc.
Box 233
Chelsea, VT 05038

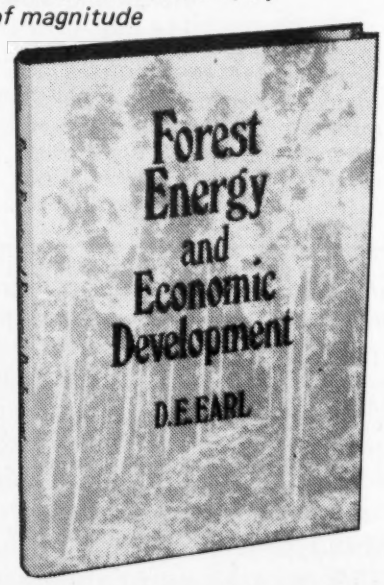
# Land Use

## Forest Energy and Economic Development

*This book presents the basic data and arguments for a major energy alternative, forest biomass, which is available for immediate use with existing technology, both in the underdeveloped world and here. It covers wood as a primary fuel, with basic figures for a 150 megawatt generating station fueled by wood, as well as charcoal, wood gas and alcohol and wood chemicals. The author has broad forestry knowledge, is an entropy economist, and has the practical experience in establishing forest biomass projects to make this an excellent book.*

*Here in the Northwest, red alder, one of the best energy plantation species, is often unutilized or defoliated with herbicides. Fossil fuel is used to burn and waste the solar energy contained in unmerchantable timber left lying on logged-over sites. Wood-fired generators are relatively clean and produce badly-needed fertilizer — calcium, phosphorus, potassium, magnesium — which can be returned to the forest or used in agriculture. Such generators are currently being considered in preference to fossil or uranium plants in Vermont. Efficient small burners could provide all the heat for homes in forest areas, for water, space heat and cooking, possibly refrigeration, and such burners would be an untold benefit to the Third World (see Erik Eckholm on the fuel wood crisis and the degradation of forest environments) by increasing by several orders of magnitude the efficiency with which this resource is used.*

*—Stevens Van Strum*




**Forest Energy and Economic Development**
D. E. Earl
1975; 128 pp.
**$13.00** postpaid
from:
Oxford Univ. Press
16-00 Pollitt Dr.
Fair Lawn, NJ 07410
or Whole Earth

There are books devoted to the study of forests as providers of timber, and others that deal with the chemical and physical properties of timber but to my knowledge none so far has attempted an holistic assessment of forests as major stores and suppliers of energy. The potential of this vast reservoir of energy is placed in perspective and the means by which it can be managed to ensure its continuity are discussed. It is hoped that in addition to providing practical help to foresters, this book will be of value to economists, planners, and sociologists working in the disparate sectors of all economies.

•

As charcoal is smokeless and almost sulphur-free, it is an ideal fuel for towns and cities and can be used in stoves capable of heating the home and providing hot water as well as being adapted for general cooking. The price is often high in developed countries but in countries where wood is plentiful it may be the cheapest smokeless fuel available.

•

**The forest is a peculiar organism of unlimited
Kindness and benevolence that makes no demands
For its sustenance and extends generously
The products of its life activity; it affords
Protection to all beings, offering shade even
To the axeman who destroys it.**

*—Gautama Buddha*

## Seeds of Woody Plants in the United States

*This government text is a treasury for anyone planting trees. It tells how to gather the seed of several thousand trees and shrubs, how to treat the seed if necessary, how to store it, and how to propagate the plants. This is all the information we need to reforest America.*

*—Rosemary Menninger*
*[Suggested by Charlie Mosher]*

**Seeds of Woody Plants in the United States**

U.S. Forest Service
Agricultural Handbook
No. 450
1974; 883 pp.
**$13.60** postpaid

from:
Supt. of Documents
U.S. Gov't. Printing Office
Washington, D.C. 20402
or Whole Earth

Sound and uninjured seeds of approximately two-thirds of American tree species fail to germinate after processing when placed under conditions considered adequate for germination. Such seeds are said to be dormant. In some dormant seeds morphological changes must take place before germination can start. For others, parts of the seed, most often the embryo and less often the endosperm, must undergo physiological changes before a germination readiness state is reached. Under natural conditions necessary morphological and physiological changes take place gradually under varying combinations of aeration, moisture, temperature, and light. By duplicating key conditions of the natural environment in the laboratory or nursery, dormant seeds can be induced to germinate within a reasonable length of time.

## Small Farm Energy Project Newsletter

*The nice thing about this newsletter is that it is down-home America working out the energy options, change from the inside out. Each issue features specific energy projects that farmers are doing with the encouragement of the Small Farm Energy Project, along with farm-energy news, publications, and events. It is a newsletter for farmers who still love the family farm and would like to keep it that way; consequently the discussion and projects tend to be of hard-nosed practicality.*

*—Rho Weber Mack*

**Small Farm Energy Digest**
Dennis Demmel, Ed.

**Free** (for now. Irreg. publishing dates.)

from:
Small Farm Energy Project
P.O. Box 736
Hartington, NE 68739

**George Rauenhorst of Olivia, Minn.** spoke to Energy Project cooperators recently about his work with **"heat exchangers" for heating livestock barns.** Rauenhorst has built the systems for ceilings in hog, dairy, poultry and calf barns. **The heat exchangers transfer the heat from the warm air leaving the barn to the fresh air entering it. It provides good ventilation, while conserving the heat produced by the animals, lowering the need for outside fuels for heating.** A fan is used to move the "foul" and fresh air opposite directions on either side of aluminum plates in the exchanger. Rauenhorst suggests **as high as 80% efficiency in the heat transfer and as much as a 65 degree temperature rise with the system.**

**. . . Rauenhorst promotes the idea of conservation first, before using other energy like methane or solar energy,** although he has worked with solar energy. He claims that there is twice the energy in "foul air" leaving a hog facility than there would be in the methane taken from the manure of the barn. And it takes one-tenth the energy to get that heat from exhaust air, Rauenhorst says. Solar energy changes the humidity levels from day to night. And the heat exchanger runs 24 hours per day, where solar energy is collected for less than 6 hours, although more energy can be collected per hour with a solar system.

Rauenhorst suggests that one sq. ft. of heat exchanger be used for 6 sq. ft. of floor area. Rauenhorst has contracted with another firm to construct the systems, which are usually custom made for the livestock facility. Cost runs between $5 and $10 per sq. ft. of exchanger, Rauenhorst said. **More information** on the systems is available from Ray Dot Ag Products, Inc., Route 2, Box 37, Cokato, MN 55321, phone 612-286-2103.

## Who's behind metric conversion — U.S. multi-national corporations

*by Stewart Brand*

It took the U.S. Metric Board to open my conservative eyes on this one. Up until this August, when I was invited to testify before an open meeting of the 17-member board in San Francisco, the only enthusiastic metricators I had seen were the endearing dingbats you find around any true belief.

Many of the Metric Board members, I quickly learned learned, are far from dingbats and far from enthusiastic about metrication, especially when it is coerced. In the hawk-dove spectrum of metricators, this board is regarded as intolerably dovish. The reason is simple: it is a somewhat representative body. Members are appointed to represent labor, construction, small business, education, engineering, etc. — sectors that often have much to lose and little to gain from metrication.

It was the labor and small business representatives who identified for me the primary metric hawks — American mega-corporations and branches of the U.S. Government. The transnational corporations have two things to gain from a metric America — one vast uniform marketplace and more overseas manufacturing. Labor representative Andrew Kenopensky showed me what is accompanying the announced (and widely applauded) metrication of General Motors. According to an article in the August 13, 1979, *Automotive News,* "GM To Be European Giant By '82," the company is planning to spend $2 billion on plants in Spain, Austria, France, and the Netherlands in the attempt to capture 12% of the West European auto market. At the other end of the market GM has set up a joint venture in the Philippines with the Japanese firm, Isuzu. Kenopensky explained that the metrication of garments also is tied in with increased overseas manufacture, by 41¢/hour sweatshops in Taipai.

This revelation matched what I was learning on the California Metric Conversion Council about the real reasons for changing American gas pumps to read in dollars-per-liter. Metric enthusiasts have reported the 80% preference of California gasoline vendors for the new liter dispensers as a victory for metric. What it's a victory for is monopoly. There's only one significant supplier of gas pump price calculators in the U.S. — a company called Veeder-Root in Connecticut — and they offer but two devices that measure over $1/gallon. *A.* The gallon one costs $200 and only reads as high as $1.99/gallon. *B.* The liter one costs $50 and reads up to an equivalent of $8/gallon. No devices measuring in half-gallons or quarts are offered.

An additional incentive to the gas vendor is that $1/gallon gas costs 26.5¢/liter — a more attractive *looking* price — and further price increases will not be so conspicuous. Since the gas lines have diminished however, according to one Metric Board staffer, interest in liter sales also has gone down.

(Around government, staff are almost always informed, sensible, and helpful — more so usually than the officials.)

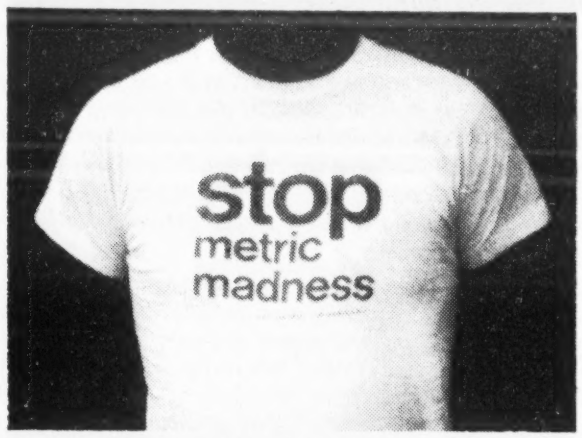
Metrication is invariably top-down. It has never been initiated by consumers or citizens. Metric conversion has never appeared on any ballot — not in this country, not in the world. Proponents know it would lose.

The U.S. Government, despite a declared policy of "voluntary" conversion, is growing less subtle in pushing metric. Many department procurement policies now *require* metric specifications from contractors. According to Mr. Kenopensky the Department of Transportation insists on metric dimensions (and tooling?) for new bridge and overpass construction, the Department of the Interior is doing the same with dam and water projects, and the Department of Defense has directed that "all new defense systems are to be metric . . ."

Is that legal, given the "voluntary" language in the U.S. metric law? The U.S. Metric Board will be addressing the issue at its October 18 - 19 meeting in Detroit. Here in San Francisco it passed a resolution by labor member Tom Hannigan giving a less aggressive interpretation to the metric law and affirming, "There is no national mandate to convert to the metric system."

Metricators announce proudly that over half of the "Fortune 500" biggest U.S. corporations are converting to metric. It appears that Americans must adjust their lives to accomodate the marketing convenience and weapons systems of big business and big government. And we must pay the entire cost. What a fate for a nice liberal idea. ■

## Stop Metric Madness T-shirt




**Stop Metric Madness T-shirt**

**$6** postpaid

From:
Americans for Customary Weight and Measure
114 East 13th St.
New York, NY 10003

*In bright rainbow colors on 100% cotton, this is the most remark-provoking T-shirt I've ever worn. And for media it's pure catnip.*

*—SB*

## Realities of Metrication

*Not at all blistering, but moderate, reasoned, well-researched and appealingly presented, this report is nevertheless devastating to metric ambitions. Even more clearly than the much-cited GAO report, it clarifies whose interests really lie where amid all the metric propaganda. And it musters much of what factual data does exist (nowhere near adequate research has been done, considering the importance of the metrication decision). It is a position paper by the AFL-CIO, prepared largely by Tom Hannigan, labor member of the U.S. Metric Board.*

*—SB*

**Realities of Metrication**
1977; 39 pp.
**$2** postpaid

from:
International Brotherhood of Electrical Workers
1125 15th St., N.W.
Washington, D.C. 20005

Metric enthusiasts naively believe consumer opposition is based on ignorance and are convinced an enlightened public will embrace change. Experience has been exactly the opposite. The experience of metrication countries proves public resistance increases directly with exposure.

•

The public has become increasingly suspicious and intolerant of the influence of transnational corporations on national policy. Unfortunately, this influence is all too often not in the national interest. These corporate goliaths, the major beneficiaries of metrication, recognize there will be very little conversion without an active federal procurement policy. The Departments of Defense, Transportation, Commerce and Interior are actively promoting metrication. Traditionally, those who will benefit most from conversion—transnational corporations, defense contractors, the automobile industry — have been unusually successful influencing the decisions of these Departments.

## Metric Japan re-legalizes customary measure

Dear Co-Ev:

. . . Japan is normally listed as a 'metric nation', yet it also has the tradition of measures based on the human body. This body-measure system is thought to have been brought over to Japan from China via Korea at the time of the advent of Buddhism (ca. 540 A.D.) and has been considered as sacred throughout its history of use. Though the exact quantities denoted by these measures have changed slightly over time, their values remain remarkably similar to the English foot/inch system:

1 *jō* = 10 *shaku* = 9.94 feet
1 *shaku* = 10 *sun* = 11.93 inches
1 *sun* = 10 *bu* = 1.19 inches
1 *bu* = 0.12 inches

However, with the advent of westernization and growth of industries in Japan, especially after World War II, the metric system came into use and was finally adopted as the official system of measurement. Although the metric system was no doubt of some benefit to Japanese science and certain precision industries, practitioners of such arts as carpentry, who have always based their work on human scale — and indeed, the traditional Japanese house is a masterwork of human measure — now found that they had to call their beloved *shaku* 303 mm., etc.

Apparently grievances finally reached the ears of the officials, though, for as of two years ago (I believe) the metric experiment was ended and the traditional *shaku/sun* system was reinstated. In all matters where human measure was deemed important, the carpenters and tailors, etc., had never actually stopped using the *shaku/sun* system even under metric names names, which had proved little more than a formalistic inconvenience; they now have returned to calling a *shaku* a *shaku* with the blessings of the government. . . .

Alfred Birnbaum
Rancho Palos Verdes, CA

## Mickey Mouse case continues

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*The surrender Disney did not accept.*

*It looked like we had a settlement fora minute there in June. Goliath would take his size elsewhere if David would promise never to pick up another stone. Walt Disney would withdraw its contempt-of-court charges against cartoonist Dan O'Neill, me, and Point Foundation, if Dan would promise never again to draw Disney characters for publication and I would promise never to print Dan's Disney characters.*

*Since it looked like the right battle and the right enemy but the wrong battlefield (a legal situation perhaps not fully using the new Congressional statements on copyright that put Dan's parody of Mickey Mouse in the Spring '79* **CQ** *well within "fair use"), we decided to cut our losses and surrender.*

*Disney's lawyers deliberated ponderously. Meanwhile the Mouse Liberation Front (MLF) was materializing from a cartoon fiction to a political reality, many shadowy artists out there viciously drawing mice. Instead of signing our surrender, Disney began making such curious demands on Dan as: stop the MLF, give Disney the names of its members.*

*Hey, lookit, I've got no great interest in Disney or the MLF. I do have considerable interest in good copyright law. We've had one gang of Hollywood heavies try to turn a* **CQ** *story into a Broadway play without crediting or paying the author. Copyright law and some effort foiled them. (Copyright did not adequately protect R. Crumb ["Keep on truckin' "] or our cover artist Robert Indiana [ LO VE ] from being severely ripped off by pirates.)*

*I don't like seeing copyright law used to stifle criticism which is supposed to be protected by law. Our brief in the Mickey Mouse Case requests that if (when!) we defendants win, Disney should pay our court costs ($10,600 so far). That's not common in American law, but it should be. As it stands, bullies have the advantage in court.*

*We'll tell you what develops in the next legal round this September. Meanwhile, here follows the reply of Walt Disney Productions to Dan O'Neill, on the for pages we offered by mail, in* **CQ**, *and in the daily* **Variety**. *No acknowledgement was made of our letter. There's been no direct contact at all from Disney. And they do not talk to press on the matter, period.*

*—SB* *more →*

Walt Disney's reply to Dan O'Neill.

Walt Disney's reply to Dan O'Neill.

Walt Disney's reply to Dan O'Neill.

*Do not connect the dots.*
*—SB*

# Understanding Whole Systems

## The California Water Atlas

*The realization that water is rapidly becoming a more critical resource than energy — and a more explosive political issue — leads to recognition of the need for thorough collection and easily understandable presentation of all the fundamental water data. (The lack of such information in the energy field has caused much of our current hysterical energy policy.)*

*Here is a pioneering example of how best to present the big water picture for any area — in this case it's California, a state uniquely defined by its water situation. Happily, the book is a major success on several counts. It is a spectacular browse — dazzling full-page color maps and charts, needle-perfect resolution of highly-detailed satellite photos of river systems, intriguing historic photos — in all a piece of extremely fine bookmaking. The range of the contents approaches comprehensive — virgin flow, history of development, irrigation and crop use, water quality, ground water, snowpack, water treatment, dams, water law, water economics, the '76-'77 drought, etc., etc. And solid, well-researched text by sundry moist experts.*

*It's an important book. This is the mutual frame of reference, detailing the larger and smaller contexts that permit resolution of policy issues that otherwise might stalemate on for decades.*

*(Fortunately other reviewers are also raving about the book. If I were the only one, it would be suspect because several* CQ*-ers were involved in the project. I initiated it in the Governor's office. Don Ryan did some of the outstanding cartography. Peter Warshall advised and wrote some text.)*

*The oversize book (15½" x 18") is a buy at $37.50, but get it now. Only 11,000 were printed and there are no plans in effect for a second printing. Deplorable oversight.*

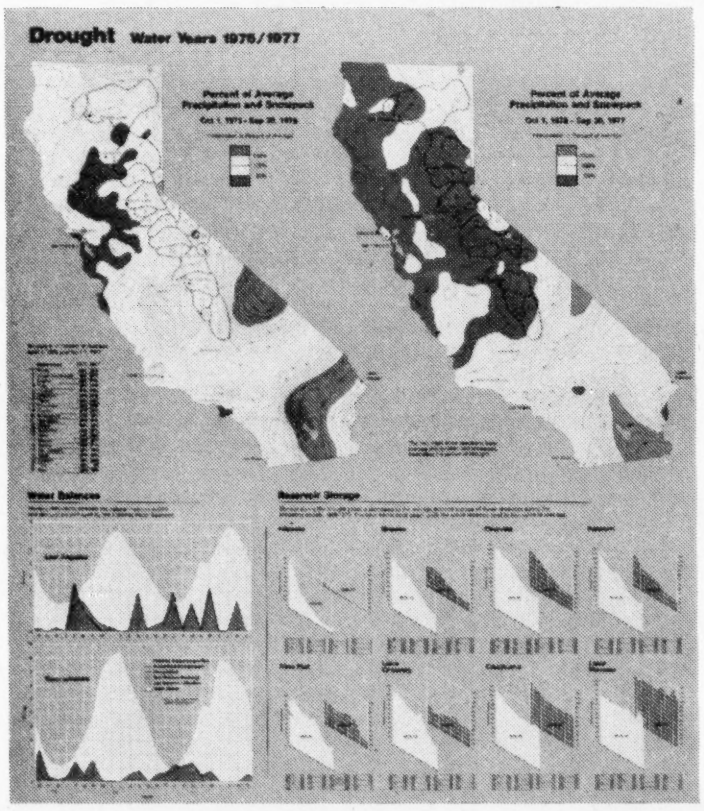
*—SB*

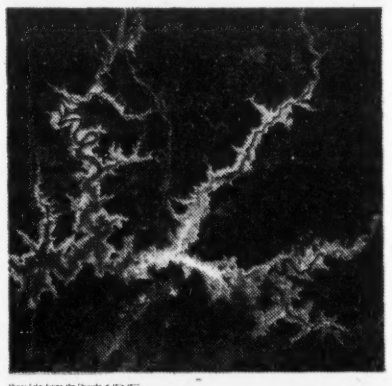
**The California Water Atlas**
William L. Kahrl, et al.
1978, 79; 118 pp.
**$37.50** postpaid

from:
William Kaufmann, Inc.
One First Street
Los Altos, CA 94022

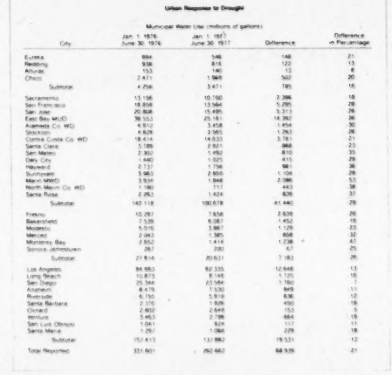
or
General Services
Publications Section
P.O. Box 1015
North Highlands, CA
95660

or Whole Earth



Shasta Lake during the Drought of 1976-1977



Urban Response to Drought

Municipal Water Use (millions of gallons)

| City | Jan. 1, 1976 - June 30, 1976 | Jan. 1, 1977 - June 30, 1977 | Difference | Difference in Percentage |
|---|---|---|---|---|
| Eureka | 694 | 546 | 148 | 21 |
| Redding | 936 | 816 | 120 | 13 |
| Arcata | 153 | 140 | 13 | 8 |
| Chico | 2,411 | 1,969 | 442 | 20 |
| Subtotal | 4,256 | 3,471 | 785 | 18 |
| Sacramento | 13,156 | 10,760 | 2,396 | 18 |
| San Francisco | 18,858 | 13,564 | 5,295 | 28 |
| San Jose | 20,808 | 15,495 | 5,313 | 26 |
| East Bay MUD | 36,553 | 29,161 | 14,392 | 39 |
| Alameda Co. WD | 4,912 | 3,458 | 1,454 | 30 |
| Stockton | 4,629 | 3,565 | 1,063 | 26 |
| Contra Costa Co. WD | 18,414 | 14,633 | 3,781 | 21 |
| Santa Clara | 7,189 | 4,921 | 2,268 | 32 |
| San Mateo | 2,302 | 1,492 | 810 | 35 |
| Daly City | 1,440 | 925 | 515 | 36 |
| Hayward | 2,731 | 1,756 | 981 | 36 |
| Sunnyvale | 3,983 | 2,855 | 1,104 | 28 |
| Marin MWD | 3,934 | 1,848 | 2,086 | 53 |
| North Marin Co. WD | 1,180 | 717 | 463 | 39 |
| Santa Rosa | 2,263 | 1,424 | 839 | 37 |
| Subtotal | 142,118 | 100,678 | 41,440 | 29 |
| Fresno | 10,297 | 7,658 | 2,639 | 26 |
| Bakersfield | 7,538 | 6,087 | 1,452 | 19 |
| Modesto | 5,015 | 3,987 | 1,028 | 20 |
| Merced | 2,043 | 1,385 | 658 | 32 |
| Monterey Bay | 2,652 | 1,414 | 1,238 | 47 |
| Stanislaus Jamestown | 267 | 200 | 67 | 25 |
| Subtotal | 27,814 | 20,631 | 7,183 | 26 |
| Los Angeles | 94,983 | 82,335 | 12,648 | 13 |
| Long Beach | 10,873 | 9,148 | 1,725 | 16 |
| San Diego | 25,344 | 23,584 | 1,760 | 7 |
| Anaheim | 6,479 | 5,530 | 949 | 11 |
| Riverside | 5,195 | 4,545 | 650 | 12 |
| Santa Barbara | 2,403 | 1,913 | 490 | 19 |
| Oxnard | 2,603 | 2,549 | 54 | 2 |
| Ventura | 5,453 | 4,788 | 665 | 12 |
| San Luis Obispo | 1,081 | 924 | 157 | 15 |
| Santa Maria | 1,291 | 1,060 | 231 | 18 |
| Subtotal | 154,415 | 136,882 | 19,531 | 12 |
| Total Reported | 331,601 | 262,662 | 68,939 | 21 |

77

## The Jesus Incident

*Frank Herbert wrote of his most famous science fiction novel,* **Dune**, *as an ecological work. It wasn't particularly, though superb otherwise. But this new thriller, co-authored with poet Bill Ransom, is utterly ecological. The plot is a continuation from his other best book,* **Destination: Void** *(1973) — a vast spaceship whose artificial intelligence runs away into God-hood for its passengers. Ship demands, "How will you Wor-Ship?" It is in relation to the attempted colonization of a demanding planet called Pandora that the answer is learned. Pandora's vast seas are filled with an intelligent kelp meta-self called Avata. The Jesus in the title is Jesus Christ, no alien to the story but one of many inspirational links to the preserv-ing of Earth's one life.*

*—SB*

**The Jesus Incident**
Frank Herbert and
Bill Ransom
1979; 405 pp.
**$10.95** postpaid

from:
G.P. Putnam's Sons
200 Madison Ave.
New York, NY 10016

or Whole Earth

*From you, Avata learns of a great poet-philosopher who said: "Until you meet an alien intelligence, you will not know what it is to be human."*

•

*You speak of gods. Very well. Avata speaks that language now. Avata says consciousness is the Species-God's gift to the individual. Conscience is the Individual-God's gift to the species. In conscience you find the structure, the form of consciousness, the beauty.*

•

*Humankerro, you speak the forgotten language of your animal past. As I speak rock, you speak this language.*

Before Panille could respond he felt the tendrils opening around him. It was a most curious sensation: He was both the tendrils and himself, and he knew he was clinging to the Avata as he was clinging to his own sanity. Curiosity was his grip upon his being. How curious this experience! What poetry it would make! Then he knew he was being dangled over the sea: The foam at the edge of a kelp's fan leaf caught his attention and held it. He was not afraid; there was only that enormous curiosity.

"The most amazing thing happened. I'd been planning a trip to India next year to get something in the way of enlightenment, but we took a vacation in Mexico and it happened there."

I told Susan he said that and she said, "It happens to Americans when they visit countries of very poor people."

An orchestra is deceptive. It doesn't sound like elbows and ties. Maybe an ecstatic furry dinosaur humming to itself or an overgrown garden hooked up to an amp.

"Once you turn it off, there are an infinite number of channels to choose from."

*– another bus voice*

*More from*

***by Anne Herbert***

*More samples from Anne Herbert's self-published newsletter for friends and subscribers. (10 issues for $15.) Choosing excerpts is so pleasant a chore, I think I'll do it more often. –SB*

The only interesting question about the post-Dan White verdict riot is why there wasn't a public address system, which is what I kept saying to Kathy when we stood on the fringes of said riot and had three different men apologize to us ("Just goes to show gay people can be as stupid as anyone else") and watched people run sporadically and listened to cars be bashed. I kept saying "Why isn't there a public address system?" remembering all those cold Easter mornings where the public address system for the Easter sunrise service canceled out at the last minute because the band got a gig (its second in 2 years of existence) or the guys just overslept, since public address systems tended to be owned by rock and rollers who not only didn't know that Sunday morning had a 6 a.m. but also didn't really know that Sunday had a morning.

I can't quite remember the gory details of how those no-show problems were solved, but I remember that they were and the valuable lesson I learned: There Is Always A Public Address System, You Just Have To Keep Making Calls. The papers mentioned that someone sent for a public address system from the Presidio, and it didn't come. How many of the thousands of dollars spent to investigate the riot will be spent to find out what happened there? Well, probably none should be because everybody knows that the Army never does anything fast except maybe sometimes in wars that have already started, so the question isn't why not that one, but who stopped looking and why, and what about Bill Graham, was he invited? Not that I was so down on the riot, it was a nice riot, made lots of sense, the system didn't work and you couldn't even fantasize the prosecution being able to appeal because if they ever could all the sixties radicals would still be on trial, but if it had been a candle-holding gathering instead of a car-bashing riot Milk and Moscone mourners could have mourned together and a wide variety of people who thought the verdict was horrible could've seen each other and not felt so isolated. A friend said she felt like giving a large sum to a gay group so they wouldn't feel so alone but she didn't know which one.

I for one would have stood out in the dark with a candle all night long singing or screaming or having moments of silence, but the riot was too specialized for me and I asked Kathy if we could leave after about 10 minutes. Violence scares me shitless, and this particular riot was in fact all male and I'm not, so I went home feeling paralyzedly angry.

They could have had, for example, an open mike, which would have made the evening's activities either more or less acceptable to editorial writers and others licensed to use the word "deplorable" at will. Either there would have been only verbal anger or someone would have logically suggested a trip to the jail.

Bernard De Voto said of SF, "Remember, Stranger, this is a Western town," and if we're going to have the part of the old West that settles some differences with shooting, why not settle others with lynching? You could've had people lined up for maybe blocks to speak into an open mike and maybe talk that idea out, one way or another. It's a real logical thought that hasn't been discussed publicly much and may be expected to go underground and come up in wierd ways whereas if gays and others had discussed openly when they were most angry "What about offing Dan White?" interesting and unexpected, perhaps even imaginatively non-violent, conclusions might have been reached. As it is the people didn't get to talk to each other on that scale – only the newspapers spoke, and I didn't see anything in them about the possibility of starting a Dan White hit fund, which was on the lips of everyone I talked to the next day, who included no gay people. So some decent proportion of the community was being really angry while the papers weren't really reporting on that widespread rage but on the riot as if it were the first riot in the history of the world so far. Nobody killed, the police held off for hours and let people act up before they came in and acted like police, the gays only trashed windows and cars and not irrelevant small businesses and innocent bystanders, it was a pretty mild riot but covered as an equal event with the verdict, which seemed to me more notable as verdicts go than the riot was as riots go but to read the after account of any riot you'd think they were each and every one unique. I treasure the *Chronicle* I bought on the way home from my brief visit to the riot which has the headlines "VERDICT ON DAN WHITE. It's Voluntary Manslaughter – Maximum Penalty 8 Years. Feinstein Reacts with 'Disbelief.' How the Slaying Occurred: The City Hall Death Drama. Gas Lines Getting Shorter." and that was all the headlines there were, nothing about a riot because it hadn't happened yet when the paper was printed. There never was one with the headline "No Sound System At City Hall" which is a wierd obsession I admit but if there had been one that night might have ended with San Francisco more of a community instead of less of one. ■

Looking out of the window I look out of most I see the front yard of our house but more importantly, I see the road, that way I can tell who's driving around town.

Julie Hastings, 17, student, Norway, Iowa

Our house borders on a school playground. We see lots and lots of kids. It's a continual-performance movie. Just look out the window and your own childhood flickers by. The bullies and the bullied; happy kickball games; marbles; conspiracies; taunts; wins and failures. I like to hold my son Timothy up to the window pane. He is six months old. His future, my past.

Donovan U. Era, 31, member of a new technologies research center

Well, that would probably be my car window, tho that wasn't what I thought of first. Driving is a strange thing – one is sitting still, all alone, passively watching the scenery go by. Everything changes outside of the window but I feel oddly contained, a snail in a shell, encased in my tin can watching the world roll by.

Marguerite Donnelly, 28, organizer with a student group, Minneapolis

I watch out in front of my house from my bedroom windows and watch the people, cars or sometimes I like to just feel a breeze and hear noises and not looking guess what's making the noise.

Bunny Magnon, 10th grader
Central H.S., Grand Rapids, Iowa

*In the Spring, 1978* CQ *I asked a list of 30 questions about people's everyday life, including, for example, What did you do with your arms today? What has a child told you lately? How did you make it through the bad time? and the three that are answered here. The idea was to help us realize the samenesses and differences in our daily lives. I got responses from 173 people and an incredible number of them were interesting and well-written. This sampling is only the beginning. More later, and a great deal of thanks to everyone who responded. —Anne Herbert*

I can see out my apartment window the face of an old tenement building about fifteen yards away, European in style, which could, if you didn't look down, belong to a narrow street in Italy or France. Many many windows, most dirty like my own, some with broken panes of glass, red curtains loosely strung. In winter some have a towel across the seam where the air leaks through. Sheets are hung from the fire escapes. In the summer, Spanish ladies, plump, dark-haired, lean out over the sill and watch their children and their men. Children on the fire escape shout and play with sticks. Adolescent girls stand by, long black hair falling in their eyes waiting to be seen by men. On the street level a cluster of men lean in the doorway, beer bellies, loud voices, polyester pants. Others, grease streaked and strong, manipulate and ponder the inner workings of some old Chevrolet. Elsewhere, young ladies, painted and prim, sit in cars and wait for young men to sweep them away. Summer. Children shout up to their mothers, horns blow, cars loaded for the beach, music echoes up and down the buildings.

A single window eternally reveals a glowing silver TV screen. Another displays a china bull, horns spread, head turned inward.

Such is the tenement at 307 Mott Street.

Barbara Chutroo, New York, NY

**What stories do you know about your grandparents?**

My grandfather was a surgeon and a good one but every time he operated he got sick. He performed his operations went outside and threw up – every single time.

He quit and became a farmer and had seven one-after-the-other-children and was a poor sort of farmer. When I was five he died. All I remember is (A) once at dinner he explained to me who Peter Pan was by flying a dinner napkin around above the mashed potatoes with his spotted hands and (B) the night the funeral home carried him away I couldn't figure out where he was going. (C) He was not really that fond of children.

Burt Jamison, 30
civil engineer
Boston, Massachusetts

I knew one grandmother, I remember her brownies and muffins more than her.

Sheila, Rhode Island

I hate my father's parents. I resent them because they are petty, bigoted, and because they are nice to me so that I feel guilty about hating them. The stories I know about them are how my grandfather tried to kill my grandmother, how badly they treat my father and uncle, how they squandered their money on shit, how they tried to keep my parents from getting married, and how they both collect unemployment and welfare while cheating on their taxes and complaining about shiftless members of certain ethnic groups. The nicest thing I can say about them is that they've given me something to try to rise above. I especially hate them for all the hangups they've given my poor Dad.

Woman high school student

One time a big steer shoved my grandfather. They were in closed quarters – a barn. O.E.'s reaction was to put his shoulder against the steer's shoulder and shove back. He slammed the steer up against the wall. Another time a mule pushed him in the barnyard. He turned around and hit the mule with his fist. He hit the mule with such force that the mule was knocked to the ground.

We went to my grandparents almost every Sunday afternoon. My parents would sit around the living room and visit with my grandparents. I remember my grandfather mostly from these times. He sat in a big chair and smoked a cigar. He never put a tooth mark on or even got the end of the cigar wet. He went to town for his cigars and rarely got more than enough for one day. He also went to town to play dominoes at the hotel. I have a picture that I treasure. It shows O.E. sitting on a chair with a cigar and me as a small child sleeping peacefully on his lap and chest.

One day he said to me, "What's wrong with your knee?" I didn't know. He showed me that my kneecap moved around on top of my knee. "Mine doesn't do that," he told me. I tried to move it. He held his leg so that the kneecap wouldn't move. I jumped up and asked my parents what was wrong with my knee. I didn't really believe him and everyone told me the truth. "Everyone's kneecap moves around," they all said. "Father, stop that," Nettie said.

We called my grandmother by her name, Nettie. We called my grandfather just Father. This was because my oldest sister couldn't say grand when she started to talk. My other grandparents who were from Georgia we called Mammy and Pappy. Nettie was really one hell of a human. She said she rarely made more than three pies a day. She and O.E. would eat pie with every meal. She always set the table when she did the dishes.

To call her prolific is an understatement. She entertained, went shopping, went on vacations, took cruises to England.

All 8 grandchildren always got a sweater for Christmas and birthdays. My sisters and one girl cousin often got two. My mother and aunts always got a handknitted sweater or two also. They always, as I recall, fit perfect. I now know there were many others around town who received her handywork. She was well-loved and respected in her community.

She loved to paint. At her death there were enough dishes so that every grandchild got a set of beautiful handpainted dishes. Her children and their wives, by that time had no more room for dishes. The same with pictures on canvas. In our house we changed the pictures on the wall with the season. There were too many to hang them all at once. She didn't start painting until she was 65. I have the last thing Nettie made. It's a big (Queen size I guess) wool blanket or spread. It's made of a couple of hundred crocheted squares. Each square is a rose. The whole thing weighs about 40 pounds and seems to be made of unprocessed wool. It's so breathtaking I'm afraid to use it. A few times I've used it and I love it. I love to curl up under heavy blankets. And this

is the heaviest of the heavies. My girl has a nice old walnut bed. On Thanksgiving we put the spread on the bed just for the day. On in the morning and off in the evening to be stored and protected.

My mother who always seemed overworked and worn and tired used to say Nettie had enough energy for two people.

Well, Nettie in later years got a kidney infection that just wouldn't stop. The doctors injected dyes into her and then took pictures. Then they ran the tests. They couldn't believe it and ran the tests a third time. They were finally convinced. She had 4 kidneys and 3 of them worked. One had shrivelled up and didn't do anything. A few years later the butchers, I mean, doctors decided to pull out her gall bladder. They took out one and there below it was another one.

Multiple organs are rare and hereditary. They skip generations so there's a small chance I could have multiple organs. I would like to have two hearts.

Whatever other organs she may have had two of we'll never know. The day before she died she took off her two diamonds and gave one to my Aunt Eleanor and one to my sister Kathleen.

Once O.E. had a heart attack. They put him in a hospital and hooked him up to a pacemaker and tried to get him baptized. He refused to be baptized. He turned over in his sleep and crossed the wires on the pacemaker. Bells started ringing, nurses started running and he started getting small electrical shocks onto his chest.

"GET THESE GODDAMNED WIRES OFF OF ME!" he bellowed as he ripped the wires off of himself. He refused to let them hook him up to that contraption again.

Later he told my father and me that since heart disease was hereditary, he was in a lot better shape than we were. None of his ancestors had ever had heart trouble.

My name is Whit Magor. I'm 26 years old and a male. I farm and do odd jobs. I hope you enjoy reading this.

Whit Magor, Frederick, Maryland

Granny left England as a young woman of 25 and with another woman started travelling the world . . . most unusual in those days . . . they got to India and visited a large temple in one of the major cities . . . my Granny came out before her friend, whose shoes were still outside the temple . . . Granny's friend was never seen again . . . complete and total disappearance . . .

Stephen Patrick Rooney, 26
Richmond, Victoria, Australia

My other grandparents were forced to leave Russia during the Revolution. I used to like the story of them being smuggled across a river, at night, in the bottom of an old rowboat. (Though it didn't exactly make sense why they would be O.K. on one side of the river but not on the other.) My grandfather had very clear blue eyes. We used to visit them routinely at their pink stucco bungalow in Palm Springs. Scrubby little bushes and hot sand and grey spotted lizards.

V. Krause, 32, mother,
Costa Mesa, California

My maternal grandfather, who is dead now, once owned a small country gas pump in west Texas during the last depression. One day Bonnie and Clyde Barrow stopped in to buy some cheese and baloney, and a tank of gas. They paid and left without noticing that the man leaning against the wall in a cane chair was the local sheriff. When the law man had recognized them he had just folded his arms over his chest and sat real still. He wasn't a fool.

Scott Booth, 33, artist, poet
and housepainter,
Manitou Springs, Colorado

My grandmother, who is now 96, came to this country from a shtetl in Galicia (now Poland) as a thirteen-year-old girl. She came alone with no papers, and had to guess, in front of customs officials, which of five other women she had never seen was her sister. If she could pick out her sister, they would let her into America, if not, who knew what would happen? My grandmother had heard that this sister, who preceded her to America, liked nice clothes, and so she picked out the woman with the nicest clothes. It was her sister, and so she stayed in America. At least that is the story she tells. Was it really her sister? No one knows for sure, but after that, they *were* sisters.

My paternal grandfather, from Russia, told me the story of how he and his sister would piss in the boots of the men who came to their house for meetings. In the cold, messy Russian winter

visitors would leave their boots in an unheated vestibule. The piss would freeze inside the boots.

My other grandfather worked as a tailor until he was 75; then became a baseball fan, a Dodger fan, to be exact . . . He never forgave them for moving to Los Angeles; no right-thinking person ever would. I remember him smoking a cigar and telling me about the famous Yankee centerfielder Mickey Mendel.

Once my grandmother – the one who had to guess who her sister was – let me sleep in her bed between her and my grandfather. I had never seen them without their teeth until then.

I cannot imagine grandparents without accents, and I feel sorry for my children, who have gringo gramps and grannies. "Sveetie, get me a glass tea." They would put a sugar cube behind their teeth and drink tea from a glass, sucking the tea through the sugar.

"You vant a piece fruit? Are you findished? De paintners vouldn't come today." Their Yiddish expressions are lost to me; I only know some of the English:

You can't piss up my back and tell me it's rain.

Bill Palmer, 29, manager National Jogging Association, Alexandria, Virginia

Story of how my grandfather's dad stowed away on a cattleship to come to New York because he deserted the Prussian army and was a fugitive. Stories about turn of the century activities . . . when cars were invented . . . The first radio, etc., . . . driving from Chicago to New Orleans with 30 spare tires in the back seat because the roads were so bad that they caused tires to come apart all the time. I was around my paternal grandparents all my life.

Karl Fortenbach

They're gone and always have been. They're kind of like my father.

Pam, 18, student, Louisiana

**What stories do you know about working outside?**

I'll tell you a story about working outside. Working outside depends on the weather. If it's extremely cold you *suffer* and you can't work outside no matter how macho you are. If it's too hot, ditto.

For all the cowboys who may be interested: I've found out that if you leave a cow alone and be gentle with her or them, they will pretty much do what you want them to do, but if you act like they do on TV, you'll never get them to do anything.

Anonymous

I worked outside in Alaska building houses and on construction. I used to have to piss outside and I really liked it. People are crazier when they work outside. There's a real freedom to being in the open.

Tusi, 30 yr. old woman, Boston, Massachusetts

From 1960 through 1964 (ages 13 to 17) I was a golf caddy at a wealthy country club in Westchester County, New York. It was good, healthy work. A caddy walks an average of seven miles per round carrying a twenty-pound bag. Most of the older caddies would do two rounds with two bags each time. By 1964, the average pay per bag per round was $6. So you could get $25 a day. Now most golf courses feature electric carts. Not the place I worked at. You had to have a caddy. That rule, combined with the affluence of the members, attracted a solid corps of professional, adult caddies. Kids like me were allowed to supplement, but we had to be strong and knowledgeable (distances, putting undulations, what have you). The older men came in two types: black men from the South and alcoholic Irishmen. For a middle-class boy like me, these guys were exciting and revealing. My father disapproved of my caddying, and hoped I would race sailboats on Long Island Sound. He figured that the older caddies would corrupt me with their foul language, sexual pecadillos, and casual attitude towards civic virtue. He was right, and I loved it. Anyway, these guys became my peer group, and I was proud of the craft. The experience made me something of a radical. You had to carry businessmen's bags, of course, and you got to see business in the raw. They never assumed that their caddies had any critical facilities, and so many of them would chatter away with racist remarks, schemes for price fixing, and other bits of nastiness that convinced me that the real corrupters of this society were not the poor bums my father was afraid of but the happy burghers of the board room. I don't think that businessmen are worse than you and me, necessarily, but I do think that money and rank are corruptive. Caddying made me an adamant income-leveller and a tedious egalitarian.

Donovan U. Era ■

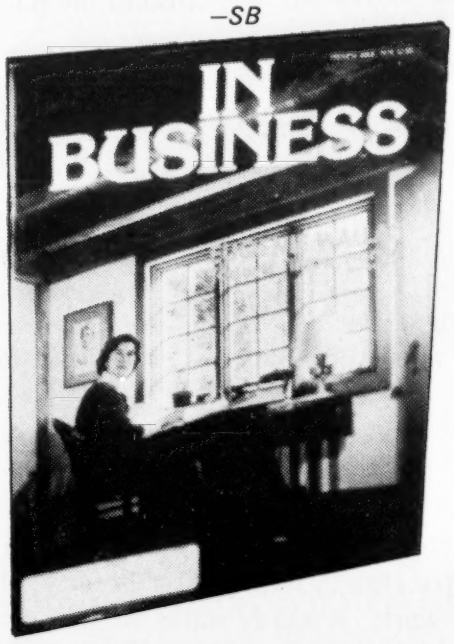
# Magazines

Content Style Consequence

## In Business

*Glory be, a national magazine for small, warm entrepreneurs. What* **Rain** *is for environmentalists, what the Briarpatch Network is for Bay Area small businesses,* **In Business** *seeks to be for everybody. The first issue looks promising — the how and why of a wood stove business, a timber framing business, home-based businesses, a restaurant, John Coles'* **Maine Times**, *a tofu factory, sweat equity in Manhattan, small capital sources, and a run-down of relevant fairs and conferences. The magazine is allied with Support Services Alliance, which also looks interesting — it provides lobbying, insurance, purchasing and legal advice, Xerox rentals, etc., for small businesses and the self-employed. Editor Jerome Goldstein used to be the sludge man at Rodale Press.*

*—SB*




**In Business**
Jerome Goldstein, Ed.
**$14** /yr (6 issues)

from:
In Business
Box 323
Emmaus, PA 18049

**In Business** is a new breed of business magazine that takes human values into account. The magazine is about the day-to-day practicalities and details of running a human-size business, and the people who run such businesses. By reading about people who share your goals, problems, pressures and experiences, we hope you'll gain more confidence . . . staying power . . . and more profits.

We know full well the kinds of problems you're up against since we're bucking them ourselves.

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The new School for Democratic Management, a San Francisco-based alternative business school, offers courses nation-wide on new forms of employee ownership, profit-sharing and participatory management. Offerings range from the traditional "Starting A Business," "Bookkeeping," and "Marketing," to the more non-traditional like assertiveness training for women entrepreneurs and management skills for cooperatives. Tuition for the courses, which last anywhere from one week to three months, averages about $65/course. The New School tries to fill gaps which traditional business schools tend to ignore by addressing itself toward smaller-scale enterprises interested in developing more democratic forms of operation. Faculty is made up of five full-time staff persons and 100 part-time regionally-located faculty members. For more information, write David Olsen, New School for Democratic Management, 256 Sutter St., San Francisco, CA 94108.

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*7. Seek more capital than you think you'll need.*

There is hardly anything more embarrassing or unprofessional looking than having to go back to a lender or investor for more capital a short time after raising all of the capital that you thought you needed. Venture capitalists suggest raising from 10 to 20 percent more capital than your most realistic cash flow projection indicates you will need.

Janet Skenfield of Domestic Environmental Alternatives, a compost toilet distributor as well as a provider of Victorian bathroom fixtures and various solar products, is our choice for the plumbing/retail storekeeper of the future:

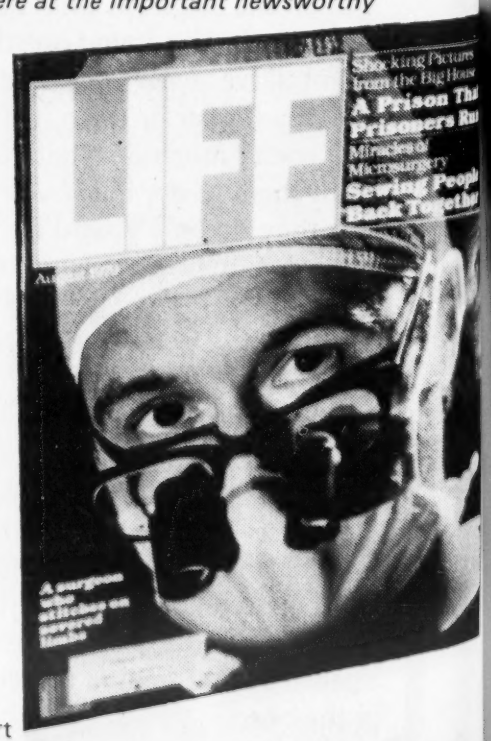
The DEA group has "designed several greywater systems, sold a few more compost toilets, and now is designing unique on-site systems that incorporate the 3 litre flush from Sweden with small septic tanks and greatly-reduced leach-fields." (DEA, 495 Main St., Box 1020, Murphys, CA 95247)

Contents Style Consequence

## Life

*The new* **Life** *is disappointing: writing square even by* **Reader's Digest** *standards, and irrelevant subject matter. Most embarrassing of all, the photography is terrible. Too much color makes everything look like the ads. This was obvious when the December, 1978* **Life** *ran a brilliant W. Eugene Smith retrospective, all black-and-white pictures, that made me cry out for the old* **Life**.

*The old* **Life** *wasn't perfect, but its value as a documentary record of history (like, in a sense, the New York* **Times***) was unsurpassed. It was there at the important newsworthy*




**Life**
Hedley Donovan, Ed.
**$18** /yr. (12 issues)

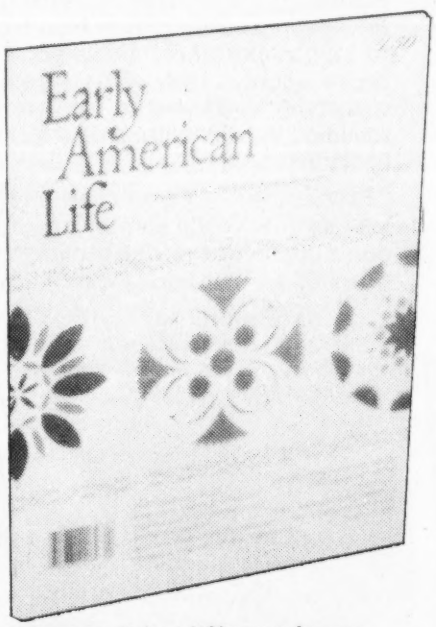
from:
Time, Inc.
541 N. Fairbanks Court
Chicago, IL 60611

Content Style Consequence

## Early American Life

*Technically accurate American nostalgia for your home, crafts, and life. I like the gentle use of color photos on non-slick off-white pages.*

*–SB*




**Early American Life**
Robert G. Miner, ed.

**$9** /yr. (6 issues)
from:
The Early American Society
Box 2534
Boulder, CO 80321

Most of our symbols are rooted in folk culture, even though modern usage is for purposes quite different from those originally conceived by the artist. Recently a friend sent me a scraper from Portugal. The dealer knew nothing of its purpose or the meaning of the curious tree-like etching on the blade. Again, I showed it to our resident expert, Eric, who examined it for a moment and said, "One thing for sure – it was used by a woman. See the Tree of Life design on the blade?"

He went on to explain that almost every culture has its counterpart of the Tree of Life. At the base is a plant pot or sometimes just a mound, from which springs the tree, its upper branches representing the generation of life and its dying foliage on the lower ones standing for the expiration of life. The pot or mound is of course the womb. And, quite naturally, it appears only on objects used or worn by women.

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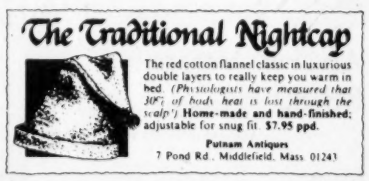
Our interest in reading EAL has increased since we purchased a 170-year-old house which we intend to restore. Could you give us a formula for mixing a white mortar cement to be used on shale?

Martin Machinoff
Hopewell Junction, New York

*Martin: Our masonry restoration expert, Robert Mack, recommends a high lime, low cement content to produce a mortar softer than the stone. Use white Portland, not the regular kind.*

*Recipe: 1 bag hydrated lime*
*¼ bag white Portland cement*
*3 cubic feet sand (same color and coarseness as the original)*

*This is for repointing. If a cement coating is wanted, write for the preservation brief on the subject, available from the Dept. of Interior. –FC*



*events and culture moments, and even if it got the story wrong it got the pictures right. That's why it's so much fun to look through old* **Life***s – they're like good coffee-table books.*

*The new* **Life** *is dominated by the* **People***-style media/personality blitz, a policy that began in 1971 just before the old* **Life** *folded. It does nothing to document the day-to-day flow of communities, something that the old version excelled at. Imagine how rich and moving a publication that covered the visual beat of 1979 city life might be.*

*Lately,* **Life** *is improving. The May issue was particularly good in its coverage of Three-Mile-Island, and there have been some smart human-interest features. It's still not enough, but editor Hedley Donovan is beginning to take some editorial chances. If he wants* **Life** *to regain its position as an institution, he'll have to hire some artful photographers and stop doing stories on balloons and Prince Charles.* **Life***'s consequence rating is a compromise between an "Eh" for right now and a "hats off" for its potential.*

*–Art Kleiner*

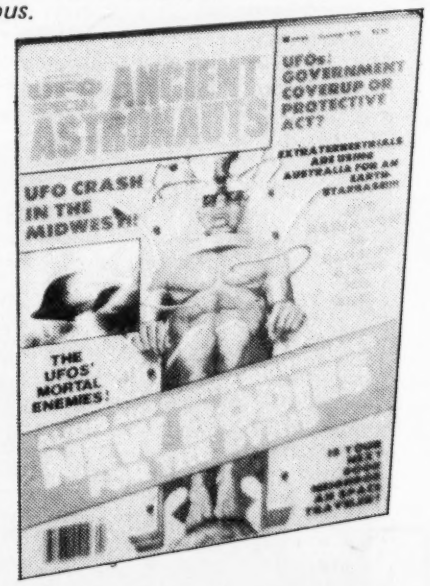
**Life** *photojournalism revived: Here's the all-night drama of reattaching a severed leg using new techniques of micro-surgery.*

Content Style Consequence

## Ancient Astronauts

*During the fifties, it's said, the American Communist Party was largely supported by the dues of its FBI infiltrators; one wonders how many of the buyers of this fascinating magazine buy it to marvel over the idiocy of its buyers. Costing as much as* **Hustler**, *muddily printed without color on the cheapest of pulp,* **Ancient Astronauts** *seems fiercely dedicated to two of Barnum's three principles: there's a sucker born every minute; nobody ever went broke underestimating the intelligence of the American public. But unlike Castaneda (for instance), these writers are good sports having a good time, and they give us a better-than-even break by being totally, hilariously outrageous. The articles unabashedly come on like penny-a-word* **National Lampoon** *or* **Fire-sign Theater.** *I haven't enjoyed a magazine so much in years.*

*—Tim Jennings*



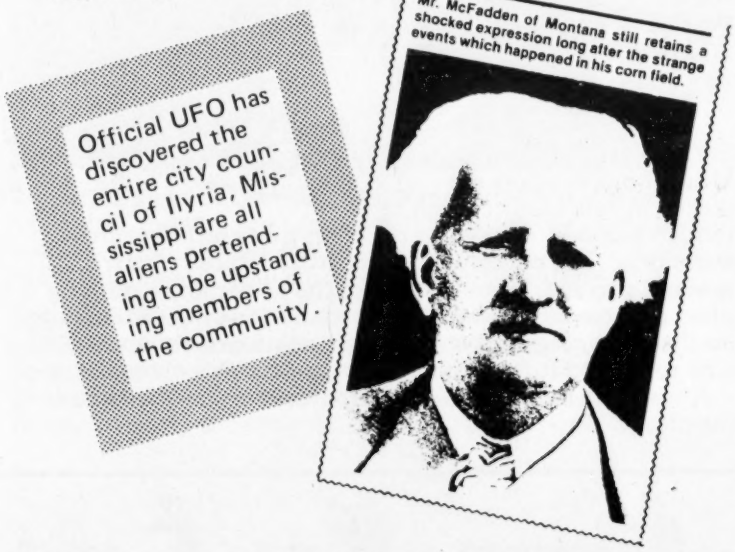

**Ancient Astronauts**
**$8.80** /6 issues (bimonthly)

from:
Countrywide Pubs., Inc.
257 Park Avenue South
New York, NY 10010

"The most obvious thing people can do is stop using microwave ovens. Don't add to the radiation already polluting the earth. People in the Northern areas can help slow the coming of the Ice Age by helping to warm up the earth. Snow and ice reflect that heat from the sun that is so vital to human existence. If everybody would sprinkle coal dust on the snow in their yards, or cover their yards with heat-absorbing black plastic, that would go a long way towards speeding up the melting of the snow and hasten the arrival of spring.

"Every bit helps. Don't buy a refrigerator with an automatic ice-maker — you'll be playing into the aliens' hands. And don't open your refrigerator door unless absolutely necessary. Turn off air conditioners during the summer."

*— Dr. Franklin, at the U.S. Bureau of Meteorology in Washington, D.C. Quoted in "Alien Radiation is Changing the World Weather System: Is a New Ice Age Ahead?"*

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Content Style Consequence

## American Humor

*A more useful than usual, and far more enjoyable than usual, academic publication. The discussions of humor are humorous. The bibliographies and rosters (radio shows, stand-up comic discographies, etc.) are comprehensive and illuminating. How to study humor without killing it is a tricky bit, nicely carried off here. The printing is good-quality mimeograph; the price is incredible.*

*—SB*

**American Humor**
M. Thomas Inge and
Lawrence E. Mintz, eds.
**$2** /yr. (2 issues)
from:
M. Thomas Inge
Dept. of English
Virginia Commonwealth University
Richmond, VA 23284

G. Legman, editor. **The New Limerick,** Second Series. New York: Crown Publishers, 1977. 765 pp., $15.95.

*Keith Crim*
*Virginia Commonwealth University*

*If your taste in verse is caprophagous*
*This book will please your esophagous.*
*But scansion and wit*
*Are absent from it*
*I prefer a quiet sarcophagous.*

**Bob Orben (joke writer for Dick Gregory, Gerald Ford, etc.):** In World War II and the Great Depression we had sort of self-help, supportive type of humor. This was the '30s, the days of the screwball comedies, the Ritz Brothers, the Marx Brothers and the humor had very little political viewpoint. In the '60s, American humor started to have an edge to it once again, and it all began with Mort Sahl and Lenny Bruce. From about 1961 to 1968 I wrote for Dick Gregory, and I used to send him a page of material a day 365 days a year, because Gregory tried to be very topical. And it was odd that the subject matter had to get a little harder with each succeeding year. I remember bringing out the material on one of the days of the Watts riot. I was working also as a writer on the Red Skelton show out in Hollywood, and it was quite a dramatic start to the day. I was sitting in my living room in Santa Monica and just getting the afternoon paper for a few of the pegs for that night's show, and I'm reading on page 3 of the Hearst paper there, a little 6-inch story that said every available policeman in the city had to mobilize and the National Guard had been put on alert to go to Watts. And I thought if this is the way they're playing the story, the whole city must be up for grabs. So I wrote the material, not mentioning the riot of course. I got in the car and was driving along the Santa Monica freeway, and there wasn't a soul on the freeway. There was a tremendous billow of smoke coming from Watts which joins the Santa Monica freeway. It was like an atom bomb explosion, this pillar of black smoke going up. The whole 10 block square area was in flames. Half way down the Santa Monica freeway, 2 shots rang out, and I looked around. There ain't nobody on that freeway but me, and so I put the accelerator down to the floor. It was the first time I've driven 98 miles an hour, at least that's what I was doing by the time I hit Pasadena. I figured if any cops wanted to join me they were welcome. The point of this whole story is that in that sort of tense atmosphere, or the times that generated the Watts riots, you don't do material like "my wife's cooking's so bad!" You've got to have something with substance, and so in the last 15 years American humor has turned very insightful, and the zaniness of the Ritz Brothers or the 3 Stooges just wouldn't be accepted today. It's a very hard, hostile, and with many sharp edges type of humor.

Content Style Consequence

## Runner's World

*The present glut of running literature leads one to debate whether further ingestion of the stuff will bring enlightenment or just befuddlement, and as a 20-year runner and former fanatic who once read every word published on the topic I've finally been overwhelmed. Now I just rely on my local running club newsletter. After all, the only thing you really need to know is the race schedule.*

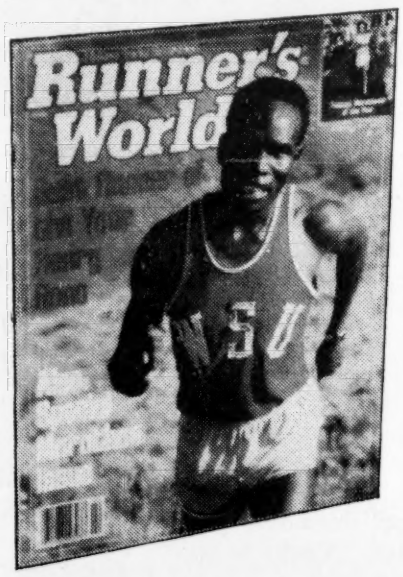
*But for a person passing from the old-tennies-and-cutoffs stage into Serious Running there's much to be said for learning from the mistakes of others, and that means hanging out with runners who know more than you, and reading the literature.*

*For years the literature meant* **Runner's World**, *top dog in a pack of 1. It was a slightly funky magazine which balanced contradictory training programs and typographical errors with shallow interviews and a West Coast bias, while also producing a new message that many heard. Editor Joe Henderson laid out his personal philosphy of non-competitive running, a ridiculous idea that not only worked, but caught on, for the readership was composed not of champs but the rank & file, the middle of the pack runners. Medical advice came from wise old Dr. Sheehan (author of* **Dr. Sheehan on Running**), *who'd personally experienced every ache, pain and malady known to sports medicine. The overall effect was to offer people a new personal truth – if you ran three miles a day in the park you were just as worthy as the guy who was first at Boston.*

*Times have changed, running's gone mainstream, and* **RW** *shows the price of success. There's still some genuine Soul there, hidden away among the full-color ads of non-running New York models peddling chic clothes and unneeded gadgets, but it's become a Slick Product. Although the competition (***The Runner, Running Times***) is closing in,* **RW** *is still the standard by which it's judged.*

*–Dick Fugett*

**Runner's World**
Bob Anderson, Ed.
**$13** /yr (12 issues)
from:
Runner's World Magazine
P.O. Box 366
Mountain View, CA 94042




Just think what finishing a marathon does to an ordinary person, the change he has undergone. He will never be the same again. He's had something happen to him so intense that he will never be able to recover. He must grapple with that for the rest of his life.

*–Ted Kostrubala*

The greatest problem for runners, and Americans in general, is not insufficient protein, but protein poisoning. Unlike carbohydrates, which are clean burning and leave only carbon dioxide and water, protein metabolism produces nitrogen and other by-products which put an enormous stress on the body's elimination systems. Because water is required for the excretion of these residues, a high-protein diet can contribute to the runner's dehydration.

*–Julian Whitaker*

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Most diseases are self-limited. If left to their own devices, most bodily ills will take their departure within 40 days – if not sooner. Unless agitated by treatments and medicines, they have a natural life expectancy of 3 to 6 weeks.

In the days before wonder drugs, this was part of our conventional wisdom. It was the concensus of the ancients that we should treat disease with respect, and not try to fight it. When fought, an illness was more likely to stand its ground and last a good deal longer.

*–Dr. Sheehan*

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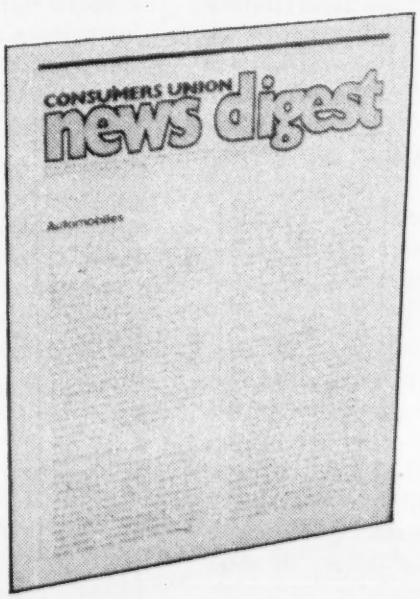
Content Style Consequence

## Consumer Union News Digest

*From the makers of* **Consumer Reports** *a nice bi-weekly collection of synopses of consumer articles gleaned from 150 periodicals. An unusually pleasant digest to scan.*

*–SB*

**Consumers Union News Digest**
(An information service prepared by the library staff of Consumers Reports Magazine)
**$36** /yr. (24 issues)
(Single copy $1.50)
from:
Consumers Union of U.S., Inc.
Blaisdell Rd.
Orangeburg, NY 10962




**Now It's "No Frills" Supermarkets**

If you like the idea of "no frills" groceries, you may be even more excited by the prospect of a "no frills" supermarket. "No frills" outlets keep down prices by cutting services to a minimum. You choose your groceries from cartons stacked on the floor, bring your own paper bags, and pay cash – no check-cashing service provided. Since these outlets buy in volume to keep overhead low, customers generally have to buy in bulk too. The market may not always have everything on your shopping list; but if you have the space to stock up and a large family to feed, you may find the savings worthwhile. For small families with limited space, having to take a giant size box of detergent or a two-pound jar of honey may simply not be worth the trouble. "Saving Dollars At 'No Frills' Supermarkets," by Loraine Serravillo, Christian Science Monitor 3/21/79 p. 18.

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**Fireplaces May Be Friendly Fuel Savers After All**

Ever since the energy crisis, the fireplace, traditional symbol of warmth and security, has suffered disparagement. Armchair experts delight in revealing that a fireplace actually wastes heat because the warm air it draws from the interior of the house has to be replaced by cold outside air that must be heated by the furnace. Now there are signs that the fireplace's sullied reputation may be redeemed. A study at Auburn University in Alabama shows that if the outside temperature is above 15 degrees F. or the furnace is turned off, the typical fireplace will contribute more heat than it consumes. Not to be minimized, either, is the fireplace's ability to lure the whole family into one room. It is then easy to save on fuel by turning down the heat in the rest of the house. "Fireplace's Reputation Defended," by David F. Salisbury. Christian Science Monitor 3/21/79 p. 3.

# GOOD MOVIES

BY
SHEILA BENSON

☆

Two-thirds of **APOCALYPSE NOW,** Martin Sheen's journey upriver through madness seeking the lost Col. Kurtz, is surreal, biting, visually enrapturing. He is us, seeing Vietnam from the underside. (God knows nothing is understated: in 70 mm. – the only way to see it – you reel back, realizing a whole insurgent army could be lost in Sheen's chest hair.) The controlled megalomania bursts its springs with the appearance of that great monolith, the unplayable Kurtz (Marlon Brando). The sacrificial slaying of a great caribou, its brown hump slashed to reveal a watermelon pink interior, intercut with the bringing down of Kurtz is only part of the heavy-handedness of the conclusion. There are memorable individual performances, particularly Sheen, Robert Duval as the surfing commander, Frederic Forrest as the Chef, and a marvelous jackal portrayal by Dennis Hopper, as a combat photographer who could as easily be the in-house photog for the Manson family. The film's star, however, is Vittorio Storaro (**The Conformist**, **1900**, **Last Tango**, **Agatha**) whose cinematography gives the fullest sensuousness and poetry to Coppola's vision.

☆

**YANKS** was written from an original story by Colin Welland, who might well have been one of the little boys in his film, staring wonderingly as his small part of rural England is overrun by American soldiers during World War II. Welland, who co-authored the screenplay with Walter Bernstein and John Schlesinger, has turned those memories into a loving tribute, examining the feelings of both sides: of G.I.s and officers as unwilling invaders, and of English families, both county (Rachel Roberts, Tony Melody) and gentry (Vanessa Redgrave) putting them up and putting up with them.

The focal couple are Lisa Eichhorn (in a remarkable performance) as a vibrant Lancashire girl who believes she knows the pattern of her life: engagement and marriage to her lifelong sweetheart, before the Yanks arrive; and Richard Gere, as the G.I. cook drawn to her, aware, and reminded, that he's come from an Arizona corner diner to a town the Romans built.

Director Schlesinger's portrait is as colored by emotion as Noel Coward's **In Which We Serve,** and he tells as much with faces that need no words as Coward's camera did. **Yanks** is a true evocation of an era, always interesting, frequently touching. You may wish you'd known more about the peripheral American characters; the weight seems to have gone with the wonderful English cast, Wendy Morgan (the jazzy tram ticket-taker) and Rachel Roberts in particular, and the musical score at times underlines what we might have been trusted to grasp ourselves, but these are minor asides. **Yanks** is an important and welcome work.

☆

**BREAKING AWAY,** set unashamedly in heartland America, is a bittersweet look at a crucial year for four high school graduates in Bloomington, Missouri. "Cutters" (townies by any other name) they are the sons of workers in the nearby quarries, and economically college isn't an automatic step. Gentle, literate, tender and marvelously, quotably funny, Steve Tesich's remarkable first script is rounded out on both sides of the age scale. The whole family we meet are Dave (Dennis Christopher) and his parents, one of whom (Paul Dooley) may not survive his son's Italian phase beginning with his Italian bicycle and continuing through an Italian accent and shaving his legs, Italian style, to cut down wind resistance in competition bicycling. Dooley looks on these airs only a little less sourly than if his son had declared himself for the front row of the Follies Bergere.

Peter Yates' direction seems as deft in the small human details which illuminate the film as in the stirring staging of the Little Indy 500 bicycle race which closes it, and the acting of Barbara Barrie, Dennis Quaid and Daniel Stern plus the others, is true ensemble work.

**YANKS**

**BREAKING AWAY**

Ermanno Olmi's **THE TREE OF WOODEN CLOGS** won the Grand Prize at Cannes and the hearts of American critics: Andrew Sarris called it "a cinematic miracle," Vincent Canby says he used the word masterpiece for the first time in describing it. Using a cast of peasant non-actors, Olmi follows the lives of Bergano tenant farmers in the early 1900s in a lyric poem to endurance, love, the bonds of family and the interplay between nature and those living intimately with it. At its root the film is a cry against powerlessness: the punishment for cutting down an owner's sapling to fashion clogs for his small son is the loss of home and the right to live on that land for the tenant-father. The outrage seems monstrous.

**Clogs** is a very nearly perfect film, glowingly beautiful; the only small reservation would be that in his obvious love for his peasant farmers, Olmi omits *almost* any scenes of them in normal bad temper (there is one outburst between a father and son). By making them earthly saints, he robs them of an identifiable dimension.

☆

There is a touring package making its way around the country now, **The Silent Clowns,** which works like visual

APOCALYPSE NOW

THE TREE OF WOODEN CLOGS

SHERLOCK JR.

POURQUOI PAS?/WHY NOT?

NORTH DALLAS FORTY

notes to Walter Kerr's book on Chaplin, Keaton, Laurel and Hardy, Harold Lloyd, Harry Langdon and others. In the film package is **SHERLOCK JR.,** a shimmering print, and seeing it again made me understand why the elegant stoicism of Keaton had always been more appealing than Chaplin's "love-me" characters. This is the film with the masterly cinema trick as Buster walks off the screen and right down into a silent-movie audience without an apparent cut; but more than that, you see Keaton suddenly as having one of the most beautiful faces that ever glowed down from a black and white frame. The whole series is invaluable, but **Sherlock Jr.** is mandatory.

☆

**POURQUOI PAS?/WHY NOT?** (it has played under both names) is young French director Coline Serreau's first film, a serio-comedy of sexual choices and expected roles. Her basic family unit is an equilateral triangle: Sami Frey, backbone of a chaotic, amiable household, and two who love him, and each other, a jazz pianist (Mario Gonzalez) and a sturdy Parisienne (Christine Murillo) separated from a rigid and complicatedly awful husband. What starts as a triangle ends as a parallelogram in the person of Nicole Jamet, but nothing about the film is predictable. Serreau has a deft hand, a beautiful eye, and an open heart and mind. (One of her images has stayed with me since the film first appeared at the San Francisco Film Festival last fall: that of a small, balding, business-suited man alone in an elegant French drawing room, pouring a pitcher of milk over his head – the first time we realize he is quite mad.)

☆

You have to skim over the surface of **TIME AFTER TIME** rather than nit-picking its time-travel eccentricities of logic, but its premise, antagonists Jack the Ripper and H.G. Wells thrust forward (via Wells' time machine) into present-day San Francisco, is lively. The film has as much style as director Nicolas Meyer's earlier script, **The 7% Solution,** and Malcolm McDowell's Wells and Donald Sutherland's Ripper are first rate.

☆

**NEWSFRONT,** another of the Australian wave, is a rich, fascinating film with a grand central idea: a portrait of three decades through the eyes of the newsreel camera and a behind-the-scenes look at that newsworld itself. Laconic, fast-paced, with a high-principled leading character (played by Bill Hunter) who looks a great deal like Ray, of Bob and . . ., and an office romance straight out of American Thirties' movies, **Newsfront** has both nostalgic appeal and great dollops of drama. It's enormously diverting.

☆

Nick Nolte is the reason to see **NORTH DALLAS FORTY.** From the first moment, when he raises his head from a nose-bleed-stained pillow and starts taking the painkillers which make him ambulatory, Nolte's portrait of a pro-footballer with "the best hands in the business" and a nasty habit of not playing to the front office is electrifying. A lot of the rest of the film is simplistic (we never knew until now that the sport has gone out of pro ball?), its villains are too facile, and the continuity appears to have been eaten by moths, but Nolte is more than worth the trip.

☆

If **STONY ISLAND** turns up near you, it's absolutely worth a look. Made for $380,000 on location in Chicago's South Side, it's an insider's story of the struggles of a group of young musicians to form a band. Full of fine fresh characters and a sure knowledge of music and musicians, the film is occasionally digressive but outstandingly photographed (Tak Fujimoto is a giant talent only begging to be known) movingly acted and has an honesty and warmth rarely found on the constricted commercial scene. ■

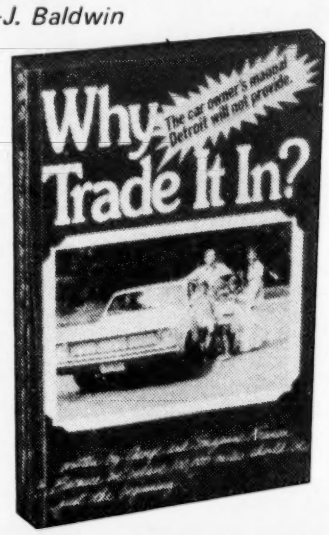
# Nomadics

## Why Trade It In?

*As car prices become increasingly insane, a book encouraging you to keep the old one going is more than welcome. The authors are correct in assuming that the need for a new car is most often psychological, and a lot of this modest book is devoted to opening your eyes to the subtle forces making you unhappy with your present wheels. Under most conditions, it is always cheaper by far to fix the old unreliable than to get a new one (which may also be equally unreliable). It's overall the most sensible book I've seen on buying and keeping a car, though experienced mechanics will already be well aware of most of the necessarily pretty general information given. For nonmechanics and the easily manipulated, this book could be a boon. I can vouch for their economic analysis. My car is 12 years old with 270,000 miles on her and is still not too bad. I have no intention of ever selling it; even with a major overhaul coming up it will still be the cheapest transportation I can get. My maintenance has closely followed what they suggest. Nuff said.*

*—J. Baldwin*

**Why Trade It In?**
George and Suzanne Fremon
1976; 247 pp.
**$5.95** postpaid
from:
Strait and Company
P.O. Box 331
Princeton, NJ 08540




Another myth the notebook may dispel is the myth that repairs are eating you up, and so perhaps you should get a new car. The notebook may show that you have actually spent only $200 over the past year for repairs, and that the remainder of the $500 in garage bills actually went for tires, tune-ups, oil changes, and other things that a newer car would require just as frequently.

•

**Engine Overhaul** means replacing or reconditioning all the parts inside the engine that have become seriously worn after long service. This may mean replacing piston rings, pistons, crankshaft bearings, connecting rods, and valve gear components. Sometimes the term also embraces the overhauling of the engine valves.

An engine overhaul is seldom required before the car has traveled 100,000 miles, and 150,000 is not uncommon. But even so, automobile owners tend to be intimidated by the prospect of major engine repairs, and the word "overhaul" is frightening to them.

It should not be. However much it costs to overhaul an engine, you will be ahead of the game financially if that overhaul makes it possible for you to put off the purchase of a new car for only one year; and in fact such an overhaul would enable your car to last for eight or ten more years. Consider these figures: at mid-1975, you would have paid no more than $750 for completely overhauling the engine of an eight-year-old full-sized Ford. (For a six-cylinder car, the cost would have been nearer $500.) This $750 is about equivalent to the *finance charge* you would have to pay if you turned in the Ford on a car that cost $3,500-plus-your-old-car. Looking at it from another angle, the view is much the same: the $750 cost of an engine overhaul would be about equivalent to *nine-month's depreciation* on the new car.

•

**Warning: Beware of Rebuilt Carburetors!**

It is possible to rebuild a carburetor so that it will perform as well as a new one. Any good mechanic, and especially any carburetor specialist in a good-sized city, can rebuild a carburetor, using new parts from the manufacturer, and do a good job of it. Unfortunately, however, buying a rebuilt carburetor in our present world is all too often a mug's game. The carburetor you buy may very well turn out to be a cleaned-up fake, with a few new parts where they show, but the same old worn parts inside. Your mechanic may know a high-quality carburetor rebuilder, and if you trust the mechanic's judgment, a carburetor from this source will probably be all right. The safer thing to do, however, is to buy a new one, and save both trouble and money in the long run.

## Diesel cars

*I'm getting considerable mail on the subject of Diesel cars. I don't like 'em. Here's why:*

*They don't cost any less to run than a gasoline car after you figure in the expensive fuel filter replacements, more frequent oil changes, larger battery and heavy-duty starter maintenance. Moreover, Diesels DO need what amounts to a "tune up" despite what the ads say. That's a tune up that you cannot do yourself either. A careful reading of the ads will also reveal that no claim of longer lifespan for the Diesel is made. Oh yes, they imply it but don't claim it. Truck Diesels do last longer but car Diesels may or may not, depending on conditions. Olds, for instance, comes right out and says that their Diesel lasts about the same as a gasoline engine. Diesels do get better fuel mileage, but the Diesel price advantage is rapidly on the way out as demand increases. Most Diesel cars must be driven 40,000 miles or so before the fuel saved pays for the premium price paid for the motor. If you keep your Diesel till overhaul time, the added costs of working over the injector pump and other special parts will soon reduce any overall economies to approximately the gasoline level.*

*Then there is the matter of fuel availability, especially on Sunday night on the way back from Lake Tehatchapoocoo. And the fuel congeals in cold weather, making all sorts of witchcraft necessary to keep things humming, assuming you can get things started at all. What it adds up to is that a Diesel only makes sense for someone who commutes in mild weather. That's not very many of us. Even the supposed smog reduction has turned out to be mostly myth. I'll stick to gasoline or some version of it.*

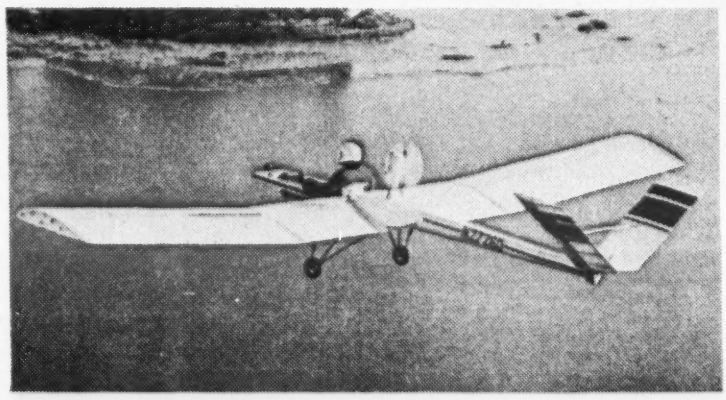
*—J. Baldwin*

## Birdman

*It's not a hangglider! It's not an airplane! It's a BIRDMAN! A minimal aircraft for one weather resistant pilot, the Birdman looks outrageously tempting to me. It's probably safer than it looks if the pilot doesn't get too smarty about weather conditions. It cruises at 40 mph; lands at about 18 mph, and glides with power off as well as many soaring training craft. The kit requires some shop skill but the high tech stuff has been done for you. Operating costs are absurdly low. I want one.*

*—J. Baldwin*

**Birdman**
Information:
**$5.00**
Kit:
**$2,500** (approx.)
from:
Birdman, Inc.
480 Midway (Airport)
Daytona Beach, FL 32014

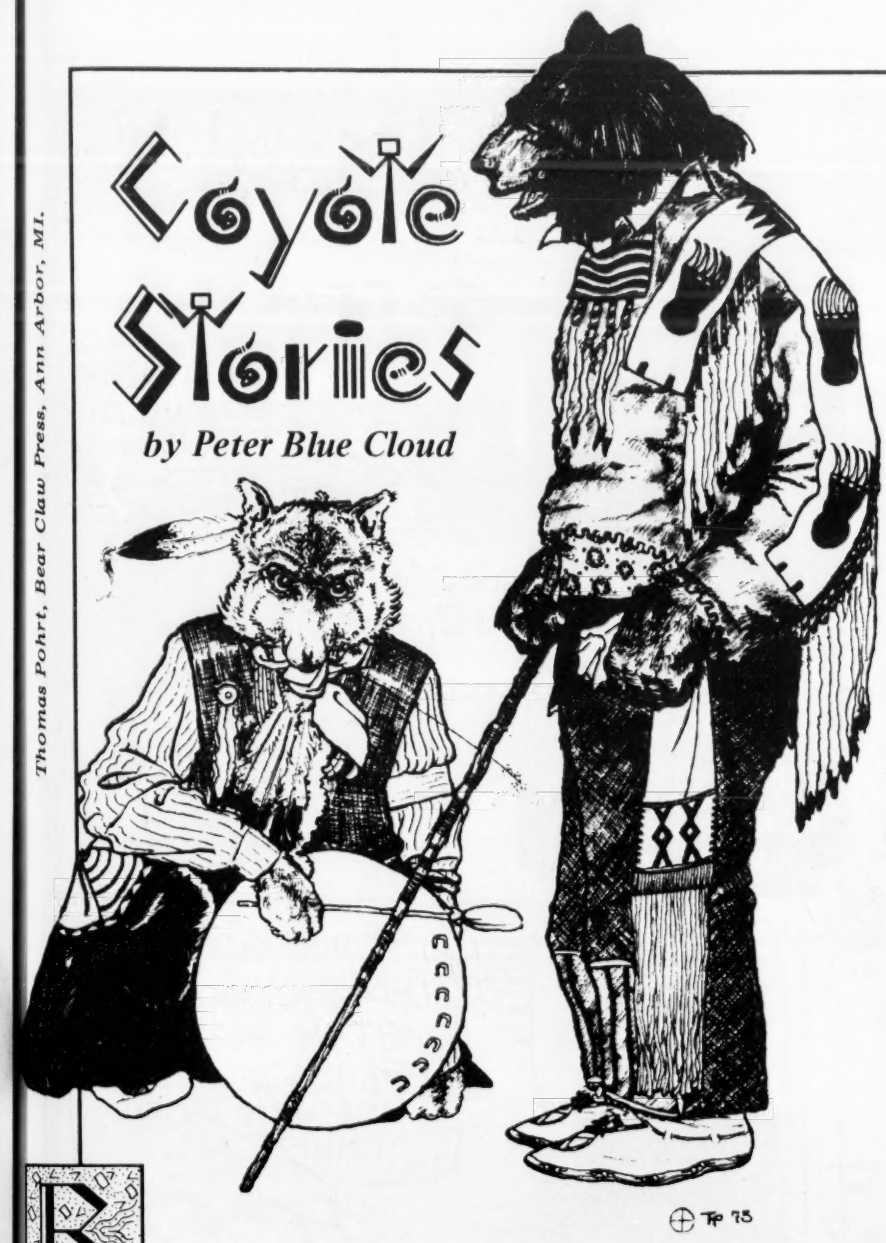




Thomas Pohrt, Bear Claw Press, Ann Arbor, MI.

# Coyote Stories

*by Peter Blue Cloud*



Thomas Pohrt, Bear Claw Press, Ann Arbor, MI.

Badger's Son went to Coyote's winter camp
Where Coyote spent his days and many nights
fashioning drums which were able
to make very beautiful songs.
"Coyote Old Man, will you teach me
to make those drums that only you can make?"
asked Badger's Son.
"And what, nephew, will your first song
be about?" And Badger's Son said,
"Why of course it will be about you."
"Nephew, I'm very sorry, but, I've
just forgotten how drums are made,"
answered Coyote.
And Badger's Son walked slowly, sadly home,
hurt, but not angry. And waited four days,
and again went to Coyote's camp.
"Coyote Old Man, I must learn to make
those drums that only you can make;
and my first song will be
a thanks to deer for his skin."

*Peter Blue Cloud, Turtle Clan, Mohawk Nation, Caughnawaga Reserve, Quebec, now lives in the Sierra foothills of California odd-jobbing, woodcarving, and working up a book of coyote stories.*

*–SB*

Coyote shook his head sadly, "Nephew,
I surely wish I could remember how
to make those drums, so I could teach you."
So Badger's Son left Coyote's camp,
and decided to have a long sweat bath
and clear his mind of making drums.

On the fourth day of his sweat, he saw a drum,
floating before him, making sounds
like tapping raindrops.
He followed his vision, and bent a frame
of cedar to a roundness. Now I must
get some deer hide for the head, he thought.
Then he picked up a stick and pretended
to beat a gentle rhythm on the empty drum.
He imagined a song.
The song was about the Creation.
All things around him grew silent,
listening to the song.

Coyote Old Man quietly entered the camp
and sat and listened until the song was done.
"Nephew," he said, "you have indeed become
a very good drum maker."
Then Badger's Son handed Coyote Old Man
the headless drum, and he, Coyote,
began to drum and sing.

And all the creatures entered camp
and began to do a round dance.
"And where," asked someone,
"did such a fine drum come from?"
And Badger's Son said, "Oh, it was
Coyote Old Man who refused to teach me
to make this fine drum."

"Let me introduce myself, Coyote."

"Well, I've heard it all now. Imagine, a turd on the trail talking to me."

"I'm not a turd, my name is Harvey."

"My old woman, she ain't gonna believe this. A turd named Harvey."

"As a matter of fact it was you who dropped me here last week."

"Hah, I got you there; I didn't pass here last week. Besides, all of my turds are unnamed, and they don't talk."

"Well, maybe it was your grandfather. Anyway, I want to start talking."

"Let me tell you something. There are people living around here. If I was you, I'd keep quiet, because those people will believe anything." ■

# A BOY AND HIS DOG IN NEVADA

— O'NEILL —

1 NEVADA .. FOUR A.M .. AUGUST .. I PONDER MARX ..

GROUCHO SAYS TO ZEPPO: "THERE'S A MILLION DOLLARS BURIED IN HOUSE NEXT DOOR .. LET'S GO DIG IT UP!"

ZEPPO: "THERE IS NO HOUSE NEXT DOOR .."

SO GROUCHO SAYS:

THEN LET'S GO BUILD ONE ..

2 LOTS OF FOLKS BELIEVE IN SOME SORT OF OLD MAGICKER WHO IN SOME WAY CONTROLS WORLD EVENTS"

MOMMY! THE BUS RAN OVER MY CAT!!

.. IT WAS GOD'S WILL HONEY .. NOW THROW KITTY IN THE GARBAGE AND WASH UP FOR DINNER ..

3 IF ONLY THE DIRTY ROTTEN COMMIES WERE THE TRUE COMPETITION FOR THE FOOD AND FUEL SUPPLY...

.. MAN DEFENDING HIS TOMATO ..

WE USED POISON ON THE CROPS .. AND IT WORKED GREAT .. THE BUGS DIDN'T EAT THE POISONED CROPS .. WE DID .. AND NOW WE FEEL SICKLY .. SO POISON IS OUT ..

BUT HOW DO WE STOP THE BUGS ..

OBVIOUSLY, WE HAVE TO LEARN TO EAT BUGS ..

4

I DIDN'T LIKE THAT PART ABOUT EATING BUGS..

THE DOG IS A SMART ASS..

THE LOGIC OF YOUR SPECIES DEMANDS IT..

O'NEILL'S DOG, BARNEY..

THE LOGIC OF YOUR SPECIES DEMANDS YOU EAT MY LEFTOVERS..

..NOT AS LONG AS THERE IS CATFOOD IN THE WORLD..

O'NEILL IS HAVING THIS PARTICULAR DOG CLONED.. 10,000 CLONE BARNEYS WILL SOON BE READY FOR DELIVERY.

O'NEILL PLANS TO SHOOT ONE BARNEY A DAY BEFORE HIS COFFEE AND CIGARETTE AND THUS REMAIN A CHEERFUL PERSON..

5

-O'NEILL TRIES TO MAKE THE DOG FEEL GUILTY-

"AND WHAT OF THE POOR KITTIES WHOSE DINNER YOU HAVE STOLEN.. WHAT DO THE KITTIES EAT ?"

"THE KITTIES CAN EAT.." SAYS THE DOG..

THE DOG STEALS OTHER ANIMALS DINNERS..

"MICE! THE KITTIES CAN EAT MICE!!"

SO NOW INNOCENT MICE MUST BE MURDERED TO SATISFY YOUR LUST FOR KITTY KIBBLE.?

6

YOU PESTER ME WITH CHEAP MORALITIES AS YOU STUMBLE INTO A REVOLUTION..

NOT A CHANCE! REVOLUTION??! IT IS TO LAUGH.. HA HO

HE TRIPPED OVER THE "N".. THE "N"!! WAIT.. YOU'LL SEE

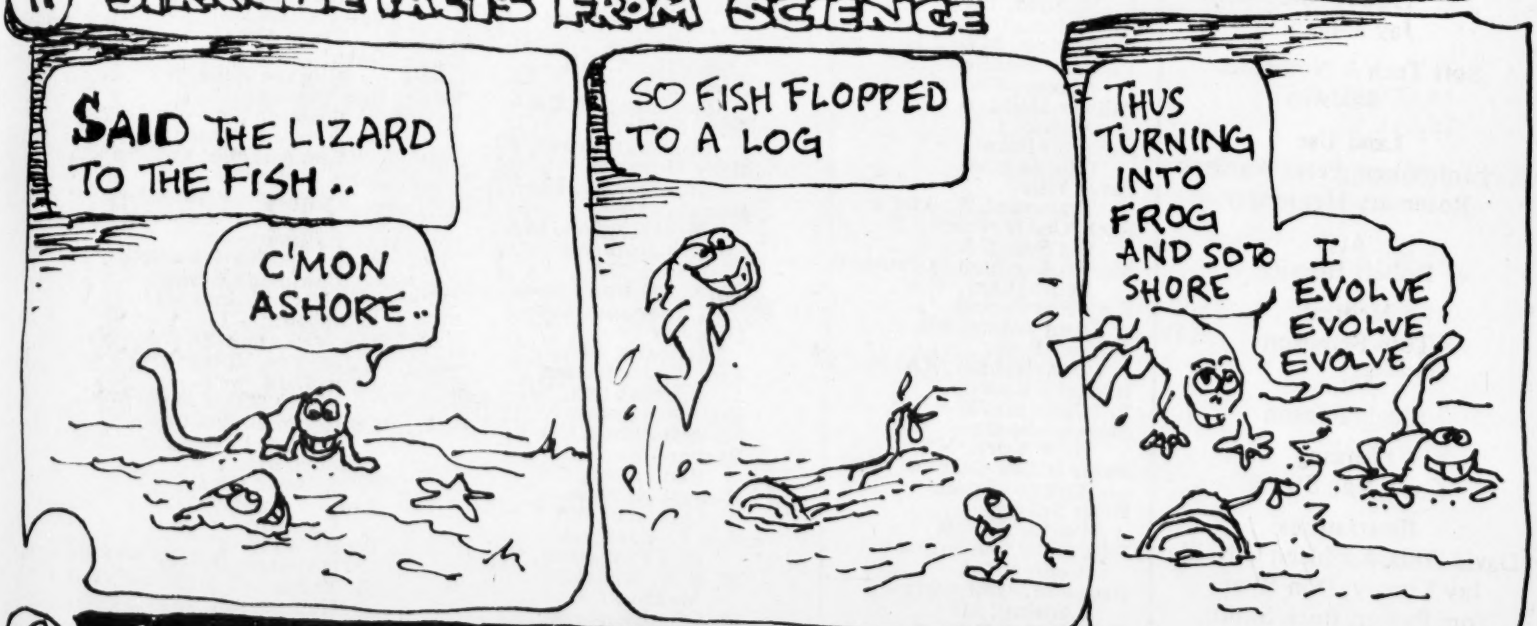
GAAAAAAAA A

7
YOU TRIPPED OVER A BIG "N"
A BIG "N"?
ACTUALLY.. YOU TRIPPED ON AN OLD ATTITUDE.. THESE THINGS ARE LYING ALL OVER THE PLACE.. A REAL MESS.. LEFTOVER THOUGHT..
MAYBE WE CAN FIX IT..
8
SEE.. NOW IT'S DIFFERANT..
YEAH.. NOW IT'S SOMETHING MONKEYS INVENTED..
EVOLUTION
DOES THE KID THINK DROPPING A CONSONANT IS ALL WE NEED TO DO..??
9
EVOLUTION IS BASICALLY A MERE CHANGE OF ATTITUDE..
WHAT'S WRONG, ROGER..?
I DON'T KNOW..
SUDDENLY I DON'T LIKE BANANAS ANYMORE..
HE DOESN'T LIKE MY BANANAS
YOU'LL BE SORRY ROGER!
I THINK I'LL HAVE A LEOPARD FOR LUNCH!!

## HELPFUL HINTS

10 WHEN CHANGING ATTITUDE;
**DO** BE CAREFUL ... PICK ON A LEOPARD YOUR OWN SIZE ..

11 STRANGE FACTS FROM SCIENCE




12 A BOY AND HIS DOG IN NEVADA WATCHING THE SUN RISE..

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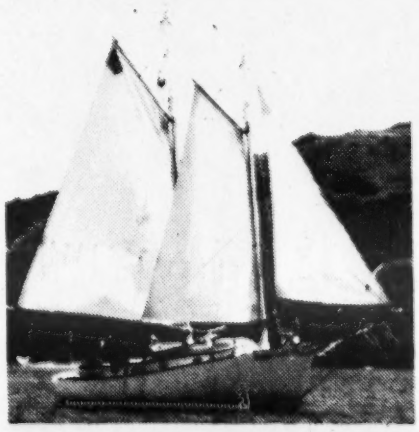

FOR SALE — My Friendship gaff schooner "Cygnus." LOA 25' 6", beam 8' 10", draft 3' 10". Built 1965 Pt. Orford cedar on oak, bronze fastened. Brand new (30 hrs.) 8 hp Yanmar diesel. New English sails, wood stove, seafarer depth sounder; sundry pumps, anchors, instruments, tools, lamps, fenders, cookware, etc. Definitively cozy below. $25,000 firm.

—SB

# CoEvolution Quarterly — Fall '79 Financial Report

| EXPENSES | May,Jun.,Jul. (Predicted) | May,Jun.,Jul. (Actual) | Aug.,Sept.,Oct. (Predicted) |
|---|---|---|---|
| Salaries and fees | | | |
| Office | $ 17,000 | **$ 18,082.39** | $ 19,000 |
| Production | 6,000 | **6,079.08** | 7,000 |
| Editors | 8,000 | **9,999.76** | 8,000 |
| Contributors | 5,500 | **5,135.00** | 5,000 |
| Office rental, materials, etc. | 12,000 | **7,941.33** | 9,000 |
| Phone | 850 | **864.78** | 850 |
| Promotion | 4,000 | **14,056.56** | 3,500 |
| Printing | 28,550 (50,000 copies) | **29,951.42** (50,000 copies) | 33,500 (50,000 copies) |
| Subscription process and mail | 16,000 | **11,269.59** | 18,000 |
| Shipping | 1,700 | **1,593.39** | 1,700 |
| Business reply | 350 | **1,110.00** | 1,500 |
| Refunds | 300 | **200.00** | 200 |
| Total | $100,250 | **$106,283.30** | $107,250 |
| | | Unit Cost (printing): $0.60 | |
| | | Unit Cost (total): $2.13 | |
| **INCOME** | | | |
| Subscriptions, gifts and renewals | $ 52,000 | **$ 55,048.35** | $ 70,000 |
| Retaining and Sustaining | 4,000 | **3,045.00** | 3,500 |
| Back Issues | 4,000 | **3,992.70** | 5,000 |
| Distribution | 20,000 | **22,251.49** | 21,000 |
| Total | $ 80,000 | **$ 84,337.54** | $ 99,500 |
| NET GAIN OR (LOSS) | ($ 20,250) | **($ 21,945.76)** | ($ 7,750) |

## POINT Financial Report

| CQ (detail above) | PAST QUARTER May, June, July 1979 | PAST YEAR 12-month Period 8/1/78–7/31/79 |
|---|---|---|
| INCOME | $ 84,337.54 | $387,416.87 |
| EXPENSE | 106,283.30 | 407,887.25 |
| **CQ Books** | | |
| INCOME | | |
| Penguin-Viking | —0— | 12,500.00 |
| Direct mail-order | 1,567.74 | 13,003.09 |
| EXPENSE | | |
| Production & Mail-Order Supplies | 1,741.50 | 26,809.44 |
| **Catalog & Epilog** | | |
| INCOME | | |
| Penguin-Viking | 7,132.27 | 11,523.52 |
| Direct mail-order | 1,280.55 | 6,919.84 |
| EXPENSE | | |
| Production & Mail-Order Supplies | —0— | 2,613.41 |
| **Maps, Posters, II Cybernetic Frontiers** | | |
| INCOME | 3,397.54 | 26,494.68 |
| EXPENSE | 3,806.29 | 6,314.47 |
| **T-Shirts** | | |
| INCOME | 2,834.00 | 16,092.27 |
| EXPENSE | —0— | 7,825.50 |
| **Miscellaneous** | | |
| INCOME | | |
| Point, Miscellaneous | 1,203.83 | 1,626.60 |
| Jamboree | —0— | 19,092.00 |
| Disney-O'Neill lawsuit (Contributions) | 103.50 | 103.50 |
| EXPENSE | | |
| Point, Miscellaneous | 873.90 | 5,614.06 |
| Jamboree | —0— | 25,384.37 |
| Index | 126.00 | 429.75 |
| Disney-O'Neill lawsuit | 11,053.05 | 11,053.05 |
| **TOTALS** | | |
| INCOME | $101,856.97 | $494,772.37 |
| EXPENSE | $123,884.04 | $493,931.30 |
| **NET GAIN (OR LOSS)** | **($ 22,027.07)** | **841.07** |

## POINT Balance Statement 31 July 1979

| | |
|---|---|
| ASSETS | |
| Cash in bank | $ 25,770.41 |
| Investments | 52,233.22 |
| Accounts Receivable Distributors | 38,811.74 |
| INVENTORY | |
| Back issues, CQ | 142,755.14 |
| Maps, posters, II Cybernetic Frontiers | 1,133.10 |
| Mail-order LWEC & WEE | 3,264.00 |
| Mail-order CQ books | 1,625.00 |
| Penguin Inventory | |
| CATALOGS ($1.73) | 10,288.31 |
| EPILOGS ($1.01) | 19,875.79 |
| Pomegranate inventory | |
| Maps & Posters | 2,350.00 |
| Miscellaneous | |
| Paper at Waller Press | 11,388.00 |
| LIABILITIES | |
| Accounts payable | -0- |
| Deferred SB salary | 6,901.57 |
| Subscription liability | 223,344.00 |

**'Or Whole Earth':** *That phrase under the access of an item in the* CQ *means that you can mail order it from:*

Whole Earth Truck Store,
c/o Zen Center
300 Page Street
San Francisco, CA 94102

*Note: Please add $1 to any order to cover shipping and handling. Add 10% to foreign orders. Inquire for UPS or Air Mail postage charges. Anything other than items so listed — orders for books, maps, etc. published by* CQ *or letters; material for the magazine, subscriptions, contributions, complaints — should be sent to:*

The CoEvolution Quarterly
Box 428
Sausalito, CA 94965

## Theodora Kroeber

**CQ** *lost a good friend when Theodora Kroeber-Quinn died of cancer on July 4 at age 82. There are some people so unique who have touched so many people that death scarcely diminishes their presence. Theo was one. Her book* **Ishi in Two Worlds** *has moved several generations now to a personal sense of what "native" means. She wrote a poem a number of years ago that appeared in a local paper – so far as I know, the only time it was published. The poem has had a life of its own, passing by word of mouth and copy machine among the populations of the bereaved. Countless people, including one of our editors, asked Theo for copies, which she always gladly supplied. I resisted printing the poem until we needed it.*

*–SB*

**Poem for the Living**

When I am dead
Cry for me a little.
Think of me sometimes
But not too much.
It is not good for you
Or your wife or your husband
Or your children
To allow your thoughts to dwell
Too long on the Dead.
Think of me now and again
As I was in life
At some moment it is pleasant to recall.
But not for long.
Leave me in peace
As I shall leave you, too, in peace.
While you live
Let your thoughts be with the Living.

*Theodora Kroeber*

*At Whole Earth Jamboree, August 1978.*

## Gossip *by Anne Herbert*

A bad mistake in last issue. In Carol Van Strum's herbicide article, on page 46, it says an EPA study found 92 parts per thousand of TCDD in some garden soil in Oregon. That was really 92 parts per trillion. Like I said, a big mistake, and not Carol's fault. We here at **CQ** did it.

Meanwhile, back at the office, the cat's away and the mice are boogeying. . . . Let me rephrase that. Stewart Brand, the regular editor, is on vacation and our annual guest-edited three quarters of an issue is happening, and it *is* a bit of a happening for the staff. The **CQ** is usually basically designed by Stewart, with varying levels of input from the layout people. But this time, the guest editors, George Putz and Peter Spectre, who are kings for a quarter and can do whatever they want with their 100 pages, decided to have Kathleen O'Neill be in charge of designing the whole thing from scratch. So Kathy took on herself all the tedious administrative, where-is-everything hassles of running a production, but shared the design fun with Don Ryan and David Wills. So pages 1 - 103 are what that trio have wrought. David, by the way, is an old/new, or new/old person. He worked on the **Epilog** and the first **CQ**, and designed the CoEvolution logo. He also redesigned it, for this issue. (Trivia: David is from England, and his first introduction to Mickey Mouse was wearing a Mickey Mouse gas mask during the war.)

Also Isabella Kirkland, an artist who disguises herself around here as a subscription expert, read George's introduction about merpeople (pp. 3 - 6) and ripped off her disguise and created a mersculpture, and there it is on the back cover, George's words come to life, or wax. (The original sculpture is for sale for $400 with transportation costs to be arranged. The figures are about 8 inches high. Contact Isabella care of **CQ**.)

We've had a lot of staff changes. Patty Phelan, best known for making the Jamboree happen against the odds, has quit to work for Planetree, a new San Francisco group that has the long-range goal of creating a hospital that includes holistic health attitudes and techniques. Susan Goodrick, **CQ** production manager and person who taught us how to get the best out of printers, has quit to work for Solutions, a San Francisco graphic and design firm. I'm taking a leave of absence to work on **The Rising Sun Neighborhood Newsletter** and write a book of fiction called **Amanda Madison Is Not Dead**, to be eventually published by **CQ**. A tant editing in my place will be Richard Nilsen, one of **CQ**'s La Use editors.

The good news about Jonathar Evelegh is that he produced a b Rock Against Racism concert, 23 acts including new wave, ro blues, gospel and folk. It not struck a blow for the good cau different cultural groups not h each other, it actually made $2 which dogood veterans know i major accomplishment. The b news about Jonathan is that he bought a motorcycle and two after buying it, acquired a brok wrist, a loused-up knee and a never ride a motorcycle again.

Meanwhile Stewart went off to to visit his new boat, *Bakea*, a found out it had serious but rep design flaws. He keeps telling in spite of everything, it's still derful boat. It must be love. supposed to go to England but conference he was going to spe was canceled, so now he's talk about getting a backpack and off to the Sierras . . .

But he'll be back, editing the of the next issue, and the who gang will be back again and ag the foreseeable future. Some got worried because of our de subscriptions and Walt Disney that the end was nigh. So far, isn't at all. The subscription has started going up again tha good response to our summer and so far Disney has cost us (gag) $10,000, which is a real but nothing like a fatal blow. don't know what else is going happen with that (for details p. 119), but so far so good.

On the other hand, since this covers the quarter that has De in it, I should mention that th most important thing keeping alive financially all these year been our annual Big Christma guys have always come throu given your friends so many C goodies that we have enough to make it through the rest of year. In honor of this phenor we have redesigned the order that everyone always gripes a created two new things to giv or yourself – a multicolored and a Whole Earth postcard described everything we've g entrancing detail on the blue that follow. So you might lo them over and see what happ And for any orders you make your continuing tolerance of necessary but boring interest money, thank you a whole lo

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Name

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D ☐ **Whole Earth**

E ☐ **Biogeographi**

F ☐ **Space Coloni**

G ☐ **Soft Technol**

H ☐ **CoEvolution**
Please indica

X-Small ☐ Sm

J ☐ **Two Cybern**

K ☐ **One Million**
continental

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L ☐ **Retaining: $**
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class, and we
town (unless
because we're

M ☐ **Sustaining:**
You get your
gratefully ble
magazine (un

N ☐ **Maniacal: $**
You get your
rest of your l

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form, above. Plea

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G ☐ H ☐ J ☐
O ☐ P ☐ Q ☐

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**le Earth Epilog** $4

**eographical Map** $3

**e Colonies** Book $4.50

**Technology** Book $4.50

**volution T-shirt** $6 (Sent UPS)
e indicate size and quantity:

all☐ Small☐ Med☐ Large☐ X-Large☐

**Cybernetic Frontiers** Book $2

**Million Galaxies** Poster $5 (Sent UPS
inental U.S. All others $7.50.)

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use we're a non-profit corporation.

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# CoEvolution Quarterly

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O☐ **1 Year CoEvolution** $12 (foreign $14)

P☐ **2 Years CoEvolution** $21 (foreign $25)

Q☐ **Please check if this is Renewal**

R☐ **CoEvolution Quarterly back issues,** $3
See overleaf for issues available
List Back Issues by number:

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S☐ **First Class** (U.S. & Canada, add $5 per year.)

T☐ **Air Mail,** add per year: Mexico & Central America $6; South America $9; Europe $9; all others $12

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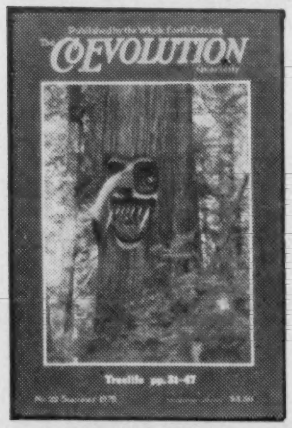
**More Gift order forms on next page**

# CQ Back Issues available

**Nos. 22, 21, 20, 19, 18, 17, 16, 15, 14, 11, 10, 2**

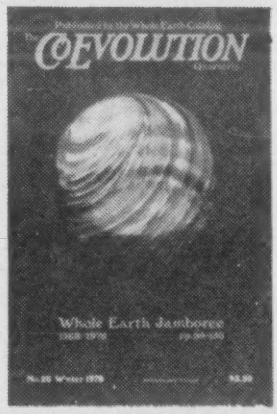
**The Annual Revolution**

*About once a year, most of the pages of the* CQ *are turned over to guest editors, who are free to print whatever they want. It helps fight the danger present in any periodical of endless unconscious rerun. This special Oceans Issue of* CQ *is an example of the phenomenon. So are Issue 19, the beat poets'* Journal for the Protection of All Beings, *and Issue 16, the special anti-television Broadcast Issue. The other three guest-edited issues are now out of print, so you should get the ones still available while they last.*

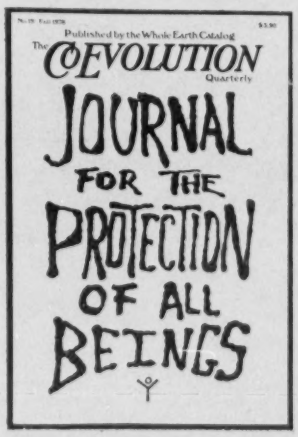



**No. 22** Reports on personal computer networks used cross-country for everything from gossip to business conferences to fantasy games, the Oregon women who forced the EPA to ban the herbicides that cause birth defects and miscarriages, the late E. F. Schumacher's belief that tree crops can save British agriculture, and the man who avoided banks and financed his own home by borrowing $10 each from dozens of friends.

**No. 21** How chemicals are harming our genes, Dan O'Neill defying the U.S. Supreme Court by drawing Mickey Mouse, Judy Chicago on "Revelations of the Goddess," most used magazines reviewed by Nicholas Von Hoffman, Ursula Le Guin, William Irwin Thompson, Margo St. James, Ernest Callenbach, Robert Rodale and many others.

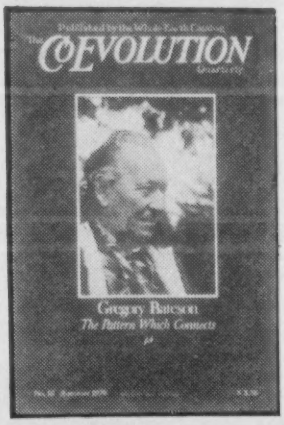



**No. 20** Fifty-six 5-minute speeches by such *CQ* regulars as Theodora Kroeber, Sam Keen, David Brower, George Leonard, Wavy Gravy, Paolo Soleri, J. Baldwin, Ron Jones, Peter Warshall, etc. Also a proposal for immediate world peace, reports on street performing, a self-sufficient solar home, edible landscapes, and excerpts from Anne Herbert's *Rising Sun Neighborhood Newsletter.*



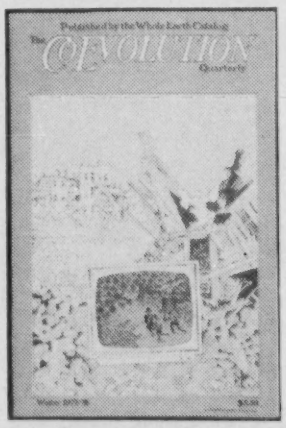

**No. 19** *An entire issue guest edited* by poets Lawrence Ferlinghetti, Michael McClure, David Meltzer and Gary Snyder. Entitled *The Journal for the Protections of All Beings,* it includes Allen Ginsberg's "Plutonian Ode," Anne Waldman's "Plutonium Chant," Susan Griffin on the relationship between the urge to destroy nature and the urge to destroy women, Ishmael Reed on preventing a race war, Lawrence Ferlinghetti's tribute to an imprisoned South African poet, Gary Snyder on the idea of nature in China, Peter Warshall on watching birds on the Farallon Islands and a previously unpublished poem by Jack Kerouac.

**No. 18** Thomas Szasz on why no one should be sent to mental hospitals, part of Gregory Bateson's new book, a special section on space — other countries' space programs, space business, and astropollution; also life in a Mexican jail, street



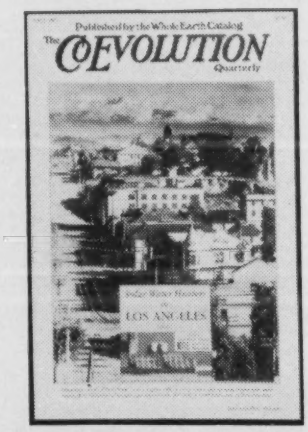

corner stories, and Mimi Farina on entertaining in institutions.

**No. 17** How the way you think may cause disease, Wendell Berry debating Earl Butz on what farming should be, Ken Kesey on cops without guns, articles on recombinant DNA as a Good Thing for the environment, how and why to tell your children stories, and off-the-road bicycles.

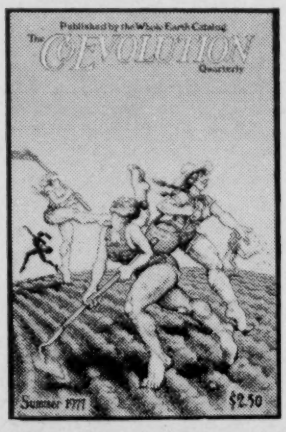



**No. 16** *Guest edited section* on Broadcast: 4 arguments for the elimination of television, an essay on how the mass media are smothering our capacity to create our own dreams, the stories of 4 lost pioneer broadcast inventors (including Nikola Tesla), Paul Krassner on the hypnotic regression of a television addict, Alvin Duskin on microwave dangers, and Marshall McLuhan talking to Gov. Jerry Brown about cultural change. Also regular *CQ* features and articles on the environmental movement in France, a new kind of wolf in Maine and firefighting in California.

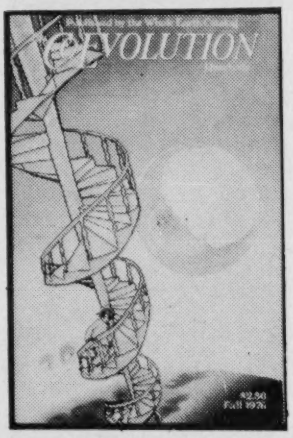
# IGNORE ALIEN ORDERS




**No. 15** How the back to nature movement in Germany in the 20s may have helped pave the way to Nazism, Huey Newton reporting on living in Cuba, articles on new crops for desert areas of the world, starting a Hawksbill turtle hatchery to save the species, what happens at a spiritualist resort, and a nursing home horror story.

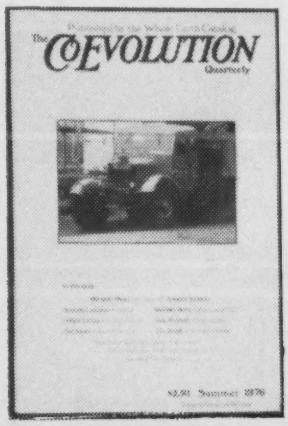



**No. 14** Voluntary simplicity analyzed from the viewpoint of spiritual leaders and of businessmen, how astronauts use the bathroom in space, Elisabeth Kubler-Ross, who cares for the dying, tells about the experiences that have made her believe that death does not exist, J. Baldwin reports on wood burning stoves and J. G. Ballard has a science fiction story about an alternative technology future (concluded in issue No. 15).




**No. 11** Underground architecture as an energy-saving, economic and very pleasant life style, arguments over whether the new data from Mars means there's life there, papers from the mind/body dualism conference, Theodora Kroeber on cross-generational marriage, Ken Kesey on education and Michael Phillips on "The American Anti-Whaling Movement Is Racist."

**No. 10** The Man Who Planted Trees and Grew Happiness: the true story of Elzeard Bouffier who




singlehandedly planted enough trees to turn a section of France from a desert to a forest; a report on the Hoedads, an Oregon tree-planting cooperative; Ursula Le Guin on menopause and Steve Baer with a reminder that the Bomb is still there and still bad.

**No. 2** Paul Krassner's *Tongue Fu.* Paul and Anne Ehrlich on the food shortage crisis, Michael McClure's GORF, and articles on apple picking, bookmaking and Stephanie Mills running a modern salon.

## Gifts

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**To order back issues (or anything else), you need to look at the complete order form on the previous page**

# Books, T-shirts, Posters & The Marble

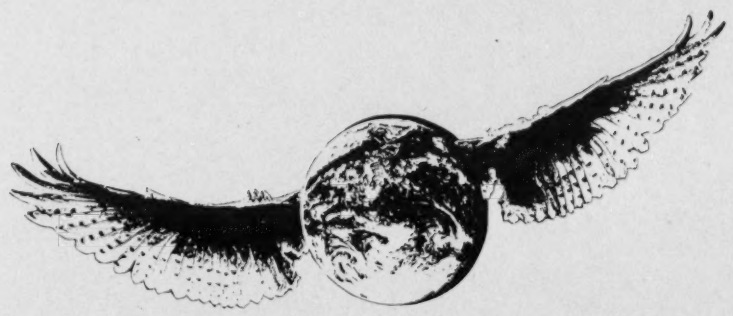
**All items are keyed to alphabetical order form. For order form and envelope see first page of blue section.**

### A The Marble $4.50

Hand-crafted by Marquis Deluxe Studios on special order for **CoEvolution,** this is the marble we used on the cover of the "Whole Earth Jamboree" issue (Winter '78). Some see it as art – an inner Earth – some as fine jewelry, some as a superior shooter.

### B Whole Earth postcards Ten cards – $3

Like the T-shirts this item evolved from private to public use. For short notes **CQ** has long used this bright, sharp Earth image on our postcards. You requested them for your own notes. Here they are.



### C Whole Earth Catalog $8

Winner of the 1972 National Book Award, the **Catalog** functions as an evaluation and access device. It contains reviews of books and tools in the original Whole Earth categories: whole systems, community, shelter, craft, nomadics, communications, land use and learning.

### D Whole Earth Epilog $4

The **Epilog** is, in effect, Volume II of the **Catalog.** It begins with page 449, and contains 320 pages of all new material, cross-referenced and cross-indexed to the **Catalog.**

### E World Biogeographical Provinces map $3

The first printing of 3,000 sold out. This second printing includes Antarctica, corrects a few errors that were in the first one, and has even sharper colors. You get a reprint of Raymond Dasmann's "Biogeographical Provinces" article with the map. 22½" x 39", mailed in a tube.

### F Space Colonies book $4.50

The space colony dream and current space efforts reported and evaluated from within by physicist Gerard O'Neill, astronaut Rusty Schweickart, Carl Sagan, Governor Jerry Brown, along with Jacques Cousteau, E.F. Schumacher, Ken Kesey, Gary Snyder, David Brower, Paul Ehrlich, Paolo Soleri, William Irwin Thompson, Richard Brautigan, John Holt, John Todd, and R. Buckminster Fuller. 160 pages, indexed.

### G Soft Tech book $4.50

Here assembled is all of the best we've seen of solar, wind, small, inventive, decentralized ingeniousness. Includes material findable nowhere else: Nitinol (the astonishing "heat-muscle" alloy); underground architecture; and editor J. Baldwin's peerless "Highly Evolved Toolbox." 176 pages, indexed.

### H CoEvolution T-shirt $6

These were such a popular item at the Whole Earth Jamboree that we've gone into a third printing. The shirts are 100% cotton and will shrink slightly. The design, surprisingly sharp and realistic, is by **CQ** regulars David Wills and Kathleen O'Neill. Five sizes to fit **any** body:

Boy's size (or small women)
XS – 16 - 18
Men's sizes
Sm – 34 - 36
M – 38 - 40
L – 42 - 44
XL – 46 - 48

### J Two Cybernetic Frontiers $2

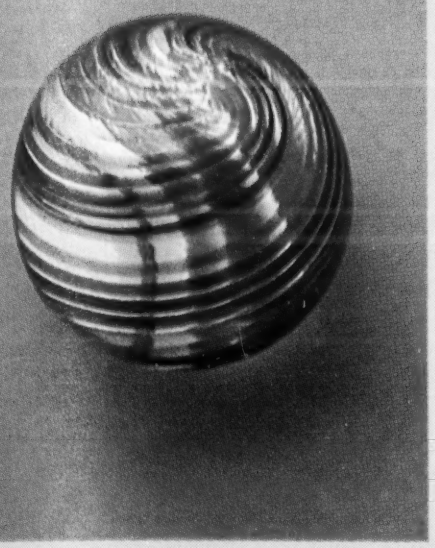
During the 2-year hiatus between the **Whole Earth Catalog** and **Whole Earth Epilog** I did nothing but two pieces of reporting. They are: "Both Sides of the Necessary Paradox (Conversations with Gregory Bateson)" and "Fanatic Life and Symbolic Death Among the Computer Bums." 96 pages.

–SB

### K One Million Galaxies map 39" x 47" $5

"On a square yard of glossy black this poster image, profound, enigmatic, beautiful, presents in a clotted tangle of tiny gray squares one abstract but faithful view of the entire thing . . . No Tantric demon or benign celestial choir provides a more vivid symbol of the vastness of the universe in which we live."

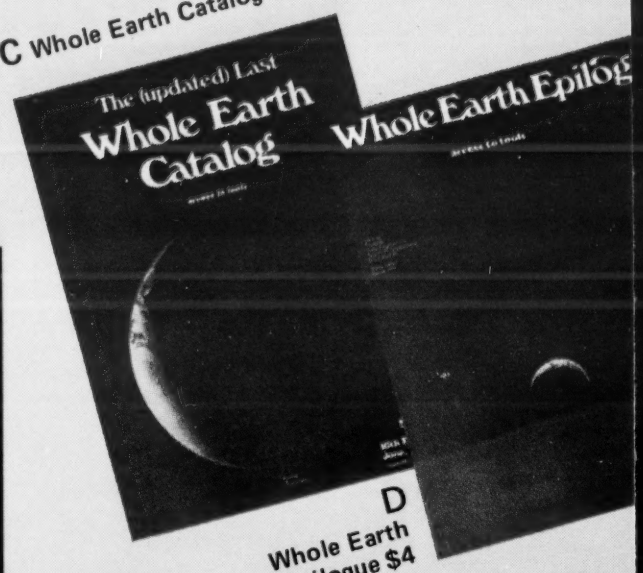
–Philip Morrison
Scientific American



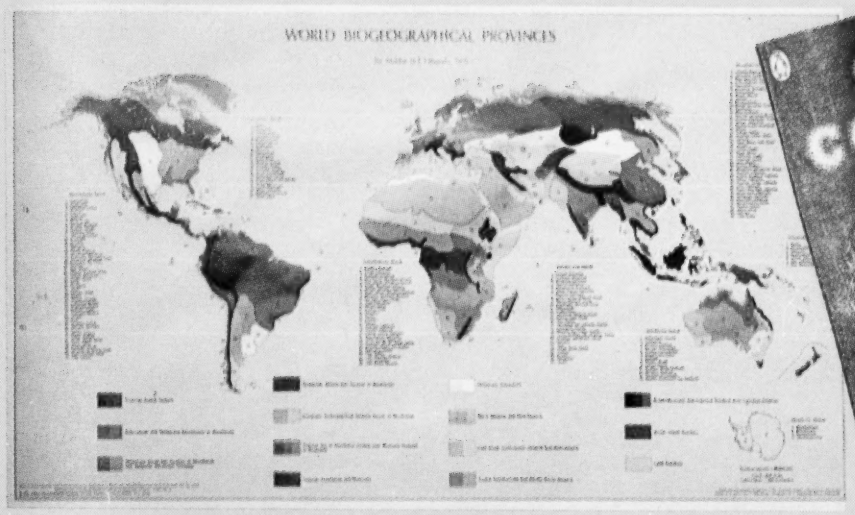
**A The Marble**
big as a quarter, shown slightly larger than life
**$4.50**

**B Ten Postcards $3**

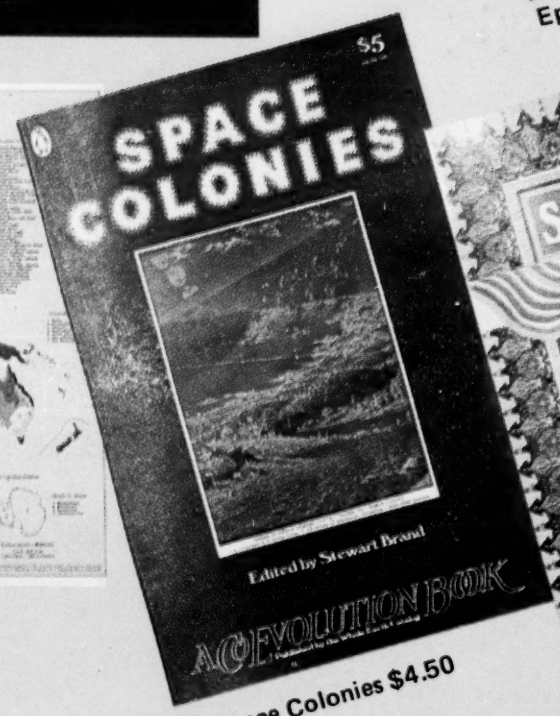
**C Whole Earth Catalog $8**




**D**
**Whole Earth Epilogue $4**




**E World Biogeographical Provinces map $3**

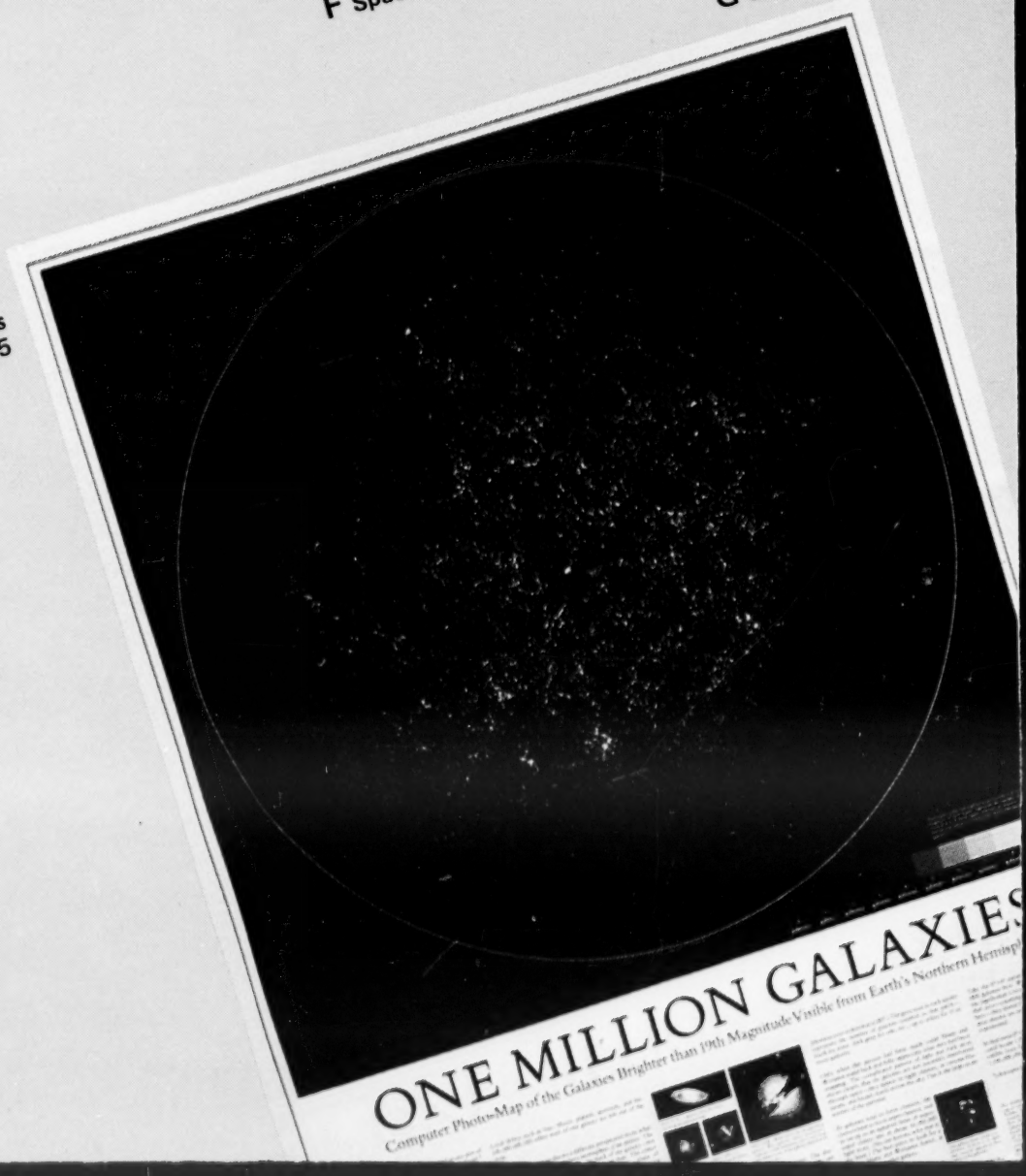


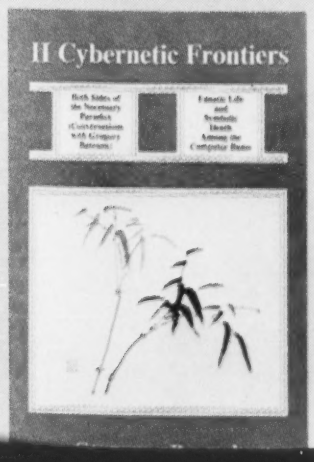

**F Space Colonies $4.50**

**G Soft Tech $4.50**

**H CoEvolution T-shirt $6**

**K**
**One Million Galaxies map $5**




**J**
**Two Cybernetic Frontiers $2**

# COEVOLUTION

Quarterly